

THRIFTY OIL CO.

March 17, 2005

O-55250

Mr. David Felix
Site Assessment and Mitigation Program
Department of Environmental Health
County of San Diego
P.O. Box 129261
San Diego, CA 92112-9261

Re: Thrifty Oil Co. Station #116
1551 Rosecrans Street
San Diego, California
CSDDEH SAM ID No. H14829-002
Global ID No. T0607302341

Subject: Corrective Action Plan

Dear Mr. Felix:

Enclosed please find the *Corrective Action Plan*, dated March 15, 2005, prepared by GeoHydrologic Consultants, Inc. for Thrifty Oil Co. (Thrifty) Station #116 located at 1551 Rosecrans Street in San Diego, California.

If you should have any questions or comments regarding this transmittal, please contact Larry Higinbotham at (562) 921-3581, Ext. 325 or myself at Ext. 390.

Sincerely,



Chris Panaitescu
General Manager
Environmental Affairs

cc: BP West Coast Products LLC
File



13116 Imperial Highway, Santa Fe Springs, CA 90670 • (562) 921-3581

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CORRECTIVE ACTION PLAN

**Thrifty Oil Co. Station No. 116
1551 Rosecrans Street
San Diego, California**

**SAM Release #H14829-002
FACILITY GLOBAL ID NO. T0607302341**

**March 15, 2005
GHC 1223**

Prepared for
Thrifty Oil Co.
13116 Imperial Highway
Santa Fe Springs, California 90670

Prepared by
GeoHydrologic Consultants, Inc.
3151 Airway Avenue, Bldg. H1
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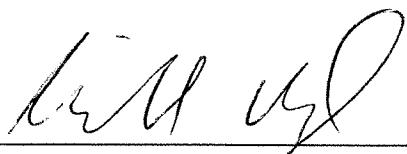
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CERTIFICATION

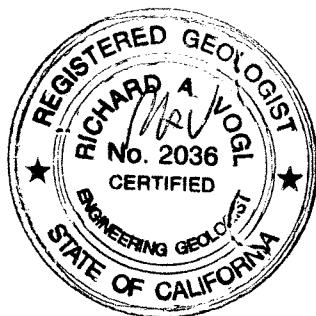
All hydrogeologic and geologic information, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a GeoHydrologic Consultants, Inc. California Registered Geologist.



3-15-2005

Date

Richard A. Vogl
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California Registered Geologist (5526)
California Certified Hydrogeologist (47)
California Certified Engineering Geologist (2036)



1.0 INTRODUCTION

On behalf of Thrifty Oil Co. (Thrifty), GeoHydrologic Consultants, Inc. (GHC) has prepared this workplan to fulfill the requirements of the San Diego Department of Environmental Health (DEH), which required Thrifty to prepare a corrective action plan for Thrifty Station No. 116 (ARCO #9575), located at 1551 Rosecrans Street, San Diego, California ("the Site"; **Figure 1**). The requirements for this work were set forth in a letter from the San Diego Department of Environmental Health (DEH) to Thrifty dated October 19, 2004. The purpose of this action plan is to provide a clear picture of the existing residual petroleum hydrocarbon affected soil and groundwater beneath the Site and to evaluate the degree of risk to the Site and surrounding area.

2.0 SITE DESCRIPTION

Thrifty Station No. 116 is presently operated as a gasoline service station facility, and is located at the northeast corner of the intersection of Rosecrans Street and Ingelow Street in San Diego, California (**Figure 1** and **Figure 3**). ARCO Products leased the Site on May 21, 1997 and currently operates the facility. The Site consists of underground storage tanks (USTs), a dispenser island and a cashiers booth and is owned by Thrifty Oil Co. The surrounding land use is a mixture of commercial and residential properties with a marina located approximately 750 feet south of the Site (**Figure 2**).

According to Telluris, Inc., as previously reported in May 17, 2001, the underground utility lines close to the Site consist of water, sewer, and storm drain at depths of three to five feet and five feet below ground surface (bgs), respectively. Other noted underground utilities include natural gas lines and electrical lines that are reportedly at typical depths of 1.5 feet bgs. Copies of previously submitted maps of buried utilities are included in **Appendix A**.

3.0 SITE CHARACTERIZATION DATA

3.1 Geology / Hydrogeology

Based on previous site investigations, the lithology beneath the Site from ground surface to approximately 21 to 23 feet bgs consists of unconsolidated clay, silty clay, clayey silt, silty sands. These predominantly fine grained soils are underlain by sand to the maximum depth of the investigations (25 feet bgs). These soils are believed to be part of the Bay Point Formation that is of Pleistocene age. The Site is in the Point Loma Hydrologic Area of the Pueblo San Diego Hydrologic Unit. According to the basin plan published by the Regional Water Quality Control Board, San Diego Region (RWQCB), the groundwater in the hydrologic area has no beneficial uses.

The depths to groundwater under the Site on May 19, 2004 ranged from approximately 4.40 feet bgs to 8.95 feet bgs. The groundwater occurs in fine-grained silty/clayey sands with low permeability and may be semi-confined to confined under the Site.

Groundwater may even occur in separate water-bearing zones. According to the May 19, 2004 data, groundwater flow appears to be easterly with an approximate gradient of 0.008 feet/foot (**Figure 6**).

As previously reported by Telluris, Inc., in May 17, 2001, Gary Gilbreath with the California Department of Water Resources was contacted on March 21, 2001 to inquire about groundwater production wells within a one-mile radius of the Site. Mr. Gilbreath reportedly indicated that the Site was located within Township 17 South, Range 13 West, Section 6 and that he did not identify any groundwater production wells in this section.

Geologic cross sections are noted on **Figure 3** and included as **Figures 4A and 4B**.

3.2 Previous Site Assessments

On June 18, 1997, SECOR International, Inc. (SECOR) supervised the advancement of five soil borings (TDD-1 through TDD-5) at the Site. Borings TDD-1 through TDD-5 were terminated at approximate depths of 25, 20, 15, and 25 feet bgs, respectively. Thirteen soil samples were analyzed for total petroleum hydrocarbons as gasoline (TPHg); benzene, toluene, ethylbenzene, and xylenes (BTEX); and methyl tert-butyl ether (MTBE). In addition to the soil borings, 15 soil samples (D-1 through D-8 and D-10 through D-16) were collected from beneath the product dispensers. The TPHg concentrations ranged from below the laboratory detection limit to 12,000 milligrams per kilogram (mg/kg), and benzene concentrations ranged from below the laboratory detection limit to 240 mg/kg. The highest TPHg and benzene concentrations were detected in the soil sample collected from boring TDD-3 at a depth of approximately two feet bgs. Boring TDD-3 was located at the southern end of the western dispenser island. The MTBE concentrations for the soil samples analyzed were below the laboratory method detection limit (MDL). Two of the borings (TDD-1 and TDD-5) were subsequently converted to two-inch diameter groundwater monitoring wells. Wells TDD-1 and TDD-5 were sampled and gauged on June 23, 1997 and reported to have static depths to water of 7.98 and 6.14 feet bgs, respectively. TPHg concentrations of the groundwater samples collected from these wells were reportedly 320 micrograms per liter ($\mu\text{g}/\text{L}$) and 1,100 $\mu\text{g}/\text{L}$, benzene concentrations were 6.4 $\mu\text{g}/\text{L}$ and 130 $\mu\text{g}/\text{L}$, and MTBE concentrations were below the MDL and 20 $\mu\text{g}/\text{L}$, respectively. TDD-5 was subsequently abandoned following completion of this investigation. The information was reported in SECOR's *Baselining Subsurface Investigation Report* dated December 18, 1997.

On August 28, 1998, Environmental Equalizers, Inc. (EEI) supervised the advancement of three 25-foot soil borings (MW-1 through MW-3). Twenty-three soil samples were collected from borings MW-1 through MW-3. The TPHg, benzene, and MTBE concentrations ranged from below the laboratory MDL to 1,300 mg/kg, below the laboratory MDL to 1.7 mg/kg, and below the laboratory MDL to 0.59 mg/kg, respectively. The borings were subsequently converted to two-inch diameter groundwater

monitoring wells. Wells MW-1 through MW-3 and existing well TDD-1 were gauged and sampled on September 22, 1998. The inferred groundwater flow direction was to the east. The analytical results for the groundwater samples indicated TPHg concentrations ranging from 1,700 µg/L to 9,800 µg/L, benzene concentrations ranging from 190 µg/L to 1,500 µg/L, and MTBE concentrations ranging from 170 µg/L to 8,400 µg/L (5,500 µg/L as confirmed by EPA Method 8260B). The well installation and sampling activities were reported in EEI's *Site Assessment Letter Report* dated October 22, 1998.

On March 23, 2000, Telluris, Inc. observed the advancement of three soil borings (MW-4 through MW-6). Each boring was converted to a two-inch diameter groundwater monitoring well ranging in depth from 20 to 25 feet bgs. The only sample which revealed benzene (0.0842 mg/kg) and MTBE (0.0266 mg/kg) concentrations was the five foot soil sample from MW-4. On March 27, 2000, the three new monitoring wells were gauged and sampled and the groundwater samples were found to contain TPHg concentrations ranging from below the laboratory MDL to 517 µg/L, benzene concentrations ranging from below the laboratory MDL to 63.5 µg/L, and MTBE concentrations ranging from below the laboratory MDL to 170 µg/L. This well installation and sampling activities were reported in Telluris, Inc's *Site Assessment Report* dated June 28, 2000.

On March 7, 2001, Telluris, Inc. observed the advancement of one soil boring (MW-7). The boring was converted to a two-inch diameter groundwater monitoring well to a depth of 20 feet bgs. The highest TPHg concentrations were detected in the soil sample collected from this boring at a depth of 10 feet bgs. The TPHg, benzene, and MTBE concentrations detected in this sample were 873 mg/kg, 2.17 mg/kg, and below the laboratory MDL, respectively. The groundwater sample collected from MW-7 revealed TPHg, benzene, and MTBE concentrations of 3,130 µg/L, 120 µg/L, and below the laboratory MDL. This well installation and sampling activities were reported in Telluris, Inc's *Site Assessment Report* dated May 17, 2001.

Quarterly groundwater monitoring has been conducted at the Site from September 1998 until June 2000 at which time groundwater monitoring was performed on a semi-annual basis starting in November 2000 until May 2004, which was the last groundwater monitoring event conducted at the Site.

Boring and well locations are noted in **Figure 3**. The historic soil sample analytical results for the Site are summarized in **Table 1**. Historic groundwater sample analytical results are summarized in **Tables 2A** and **2B**. Historic well completion details are summarized in **Table 3**. The distribution of maximum soil concentrations for TPHg, benzene, and MTBE for the historic soil data are depicted in **Figures 5A**, **5B**, and **5C**, respectively. The groundwater elevation contour map and the distribution of TPHg, benzene, and MTBE as groundwater for the May 19, 2004 sampling event are included in **Figures 6**, **7A**, **7B**, and **7C**, respectively.

3.3 Previous Remediation Activities

In December 1997, four USTs were removed from the Site and replaced with two 20,000-gallon double-walled USTs. Free product was detected on the groundwater within the UST excavation during the tank removal activities. Approximately 9,600 gallons of free product and groundwater were transported by vacuum truck to DeMenno-Kerdoon, located in Compton, California. The remainder of the groundwater was treated onsite and discharged under permit to the sewer. Approximately 1,397 tons of hydrocarbon impacted soil were removed from the Site and transported to the Soil Wash Technology facility in San Diego, California and to the American Remedial Technologies facility in Lynwood, California. In conjunction with the tank removal, SECOR collected six soil samples from beneath the product piping. The analytical results of the soil samples indicated TPHg and benzene concentrations ranging from 2,300 mg/kg to 25,000 mg/kg and from 5.5 mg/kg to 370 mg/kg, respectively. The soil samples were not analyzed for MTBE. Soil samples were not collected from beneath the USTs because of the shallow groundwater conditions (approximately eight feet bgs) and the presence of free product within the UST excavation. The results of this work were reported in SECOR's *Underground Storage Tank Removal Report* dated October 8, 1998.

3.4 Previous Soil Vapor and Upward Vapor Migration Report

On July 20, 2004, H&P Mobile Geochemistry (H&P) conducted a soil vapor and upward vapor migration survey for the Site. Soil vapor samples were collected at 2-foot depths at five locations (SV1-2 through SV5-2, **Figure 3A**) and one duplicate sample was also collected (SV5-2 dupe). Soil vapor samples were analyzed by H&P for the single ring aromatic hydrocarbons (BTEX) using EPA Method 8260, with special emphasis on benzene, since the acceptable levels for this compound are several orders of magnitude lower than the other single-ring aromatic hydrocarbons.

The results for the five samples and the duplicate indicated that benzene was the only analyte detected above the laboratory method reporting limit. Benzene concentrations were detected in SV1-2, SV3-2, SV4-2, SV5-2, and SV5-2dupe at concentrations of 0.1 µg/L, 0.2 µg/L, 0.1 µg/L, 0.1 µg/L, and 0.2 µg/L.

Calculations of the upward migration risk were performed by H&P using the worst-case scenario of the highest detected benzene concentration of 0.2 µg/L. The calculated risk using these worst-case values was reported to be 9.4 e-9 for a commercial setting and 1.1 e-7 for a residential setting, with the generally accepted risk value being 1.0 e-6. Risk calculations were not performed for other aromatic compounds since they were not detected above the laboratory reporting limit and acceptable risk levels are much higher than benzene.

H&P concluded that the survey did not show any evidence of significant levels of subsurface contamination by BTEX and that the upward migration risk calculations pass acceptable levels by factors of approximately 10 to 100 times for residential and commercial scenarios respectively, based on using the highest detected benzene

concentrations. Therefore, H&P concluded that there did not appear to be any threat to human health by this risk pathway. A copy of the complete H&P Mobile Geochemistry *Soil Vapor & Upward Migration Report*, dated August 2, 2004 is included as **Appendix B**.

4.0 SITE CONCEPTUAL MODEL

This Site Conceptual Model is based on the information contained in this report and past reports submitted for the Site. As additional information is obtained from the Site, the Site Conceptual Model may be updated appropriately. The current Site Conceptual Model is as follows:

- Soil beneath the Site consists of heterogeneous sediments including alternating layers of silty sand, clayey sand, clay, and sand. Soil beneath the water table is predominantly silty sand and clayey sand (**Figures 4A and 4B**).
- The depths to groundwater under the Site on May 19, 2004 ranged from approximately 4.40 feet bgs to 8.95 feet bgs. The groundwater occurs in fine-grained silty/clayey sands with low permeability and may be semi-confined to confined under the Site. Groundwater may even occur in separate water-bearing zones. According to the May, 2004 data, groundwater flow appears to be easterly with an approximate gradient of 0.008 feet/foot. Based on this gradient, an estimated hydraulic conductivity of a fine sand of 2.5 m/day (Todd, 1980) and an assumed porosity of 43 percent for fine sand (Todd, 1980), the groundwater velocity beneath the Site is calculated to be approximately 0.0465 meters per day or 16.98 meters per year.
- The majority of the hydrocarbon-affected soil is localized primarily in the southeast portion of the Site in the area of the former USTs (**Figures 5A through 5C**).
- The main contaminants of concern at the Site are benzene and MTBE, because of the toxicity of benzene and the solubility and taste threshold associated with MTBE. The main potential exposure pathway appears to be through ingestion of groundwater that has been impacted by these fuel constituents, however, according to the RWQCB, groundwater within this hydrologic unit has no designated beneficial uses. Under typical subsurface conditions, benzene will naturally attenuate through volatilization, dispersion, and biodegradation to plume lengths of less than 150 to 200 feet. Based on historical data for the Site, it appears that the benzene plume and MTBE plumes have been stable and/or shrinking as a result of natural attenuation. The maximum benzene concentration detected at the Site in groundwater in May of 2004 was 73 µg/L in MW-2, with the maximum MTBE concentration detected in the groundwater sample from MW-3 at a concentration of 3,520 µg/L. Graphs of the historic benzene and MTBE concentrations over time per well are included in **Appendix C**.
- The estimated mass of benzene under the Site was calculated using the available data for the Site including **Figure 5B** for soil and **Figure 7B** for groundwater. Using these distribution maps and average concentrations, the mass of benzene in soil was

estimated to be approximately 1.83 pounds or 0.83 kg and the mass of benzene in groundwater in May of 2004 was estimated to be 0.29 pounds or 0.13 kg, for a total mass of benzene in soil and groundwater estimated at approximately 2.12 pounds or 0.96 kg.

- The estimated mass of MTBE under the Site was calculated using the available data for the Site including **Figure 5C** for soil and **Figure 7C** for groundwater. Using these distribution maps and average concentrations, the mass of MTBE in soil was estimated to be approximately 0.31 pounds or 0.14 kg and the mass of MTBE in groundwater in May of 2004 was estimated to be 14.82 pounds or 6.72 kg, for a total mass of MTBE in soil and groundwater estimated at approximately 15.13 pounds or 6.86 kg.

5.0 NATURAL ATTENUATION EVALUATION

The natural attenuation rate was estimated using BIOSCREEN Natural Attenuation Decision Support System. BIOSCREEN is an easy to use screening model that simulates remediation through natural attenuation (RNA) of dissolved hydrocarbons at petroleum release sites. The software, programmed in Microsoft Excel spreadsheet environment and based on the Domenico analytical solute transport model, has the ability to simulate advection, dispersion, adsorption, and aerobic decay as well as anaerobic reactions that have been shown to be the dominant biodegradation process at many petroleum release sites. BIOSCREEN includes three different model types:

- solute transport without decay
- solute transport with biodegradation modeled as a first-order decay process (simple, lumped-parameter approach)
- solute transport with biodegradation modeled as an “instantaneous” biodegradation reaction (approach used by BIOPLUME models)

In our case all three models types would be applicable for the Site, although the solute transport without decay model will be used as a worst-case scenario. Based on the actual observed groundwater conditions at the Site, the solute transport first-order decay model appears to be most representative of actual Site conditions, including plume sizes and concentrations for benzene and MTBE. Natural attenuation analytical results were not present for the Site. Therefore the median model reported values were used for input parameters in the “Instantaneous” Biodegradation Reaction.

The model is designed to simulate biodegradation by both aerobic and anaerobic reactions. It was developed for the Air Force Center for Environmental Excellence (AFCEE) Technology Transfer Division at Brooks Air Force Base by Groundwater Services, Inc., of Houston, Texas.

BIOSCREEN attempts to answer the two fundamental questions regarding RNA:

- How far will the dissolved contaminant plume extend if no engineered controls or further source reduction measures are implemented?
- How long will the plume persist until natural attenuation processes cause it to dissipate?

BIOSCREEN has the following limitations:

- As an analytical model, BIOSCREEN assumes simple groundwater flow conditions.
- As a screening tool, BIOSCREEN only approximates more complicated processes that occur in the field.

Site-specific data for both releases was entered into BIOSCREEN to determine the degree of RNA. Site-specific data such as hydraulic conductivity (2.5 meters per day) and porosity (0.43) were based on text book values for fine grained sand as observed at the Site (Todd 1980). The Site-specific groundwater gradient, which was obtained from the latest quarterly sampling event (0.008 ft/ft) was used and the model length was set at 1,000 feet. Input parameters such as the estimated plume length and the concentrations of benzene and MTBE were also based on the actual Site data collected in May 2004. The estimated source mass of benzene and MTBE for the model run was set at the estimated mass of benzene (0.96 kg) and MTBE (6.86 kg) calculated for soil and groundwater plumes at the Site which is included in the previous section, and it was conservatively assumed that all of this mass would be an available source for groundwater contamination. The partitioning coefficient for benzene (38 L/KG) was obtained from ASTM 1995 published values and MTBE (12.59 L/KG) was obtained from the American Petroleum Institute's Strategies for Characterizing Subsurface Releases of Gasoline Containing MTBE (Regulatory and Scientific Affairs Publication Number 4699, dated February 2000). The fraction of organic carbon used (0.0025) was the mean concentration for site soils in the Los Angeles area as reported by the RWQCB in their Interim Site Assessment & Cleanup Guidebook dated May 1996, which falls within the middle of typical published values (0.0002 to 0.02). Input parameters for the instantaneous reaction model were set at the median values reported in the BIOSCREEN documentation. However, these runs are not reported in the following section since the no degradation and 1st order decay models appear to be more realistic with respect to observed Site conditions.

The input parameters and model results for benzene RNA for years 1 through 118 are included in **Appendix D**. As demonstrated by the output included in **Appendix D**, the benzene contaminant plume with no degradation and the 1st order decay model at the source area are at 0.001 mg/L at year 90, with the source area benzene concentrations below 0.001 mg/L at year 109. At year 118, all concentrations within 1,000 feet of the source are below 0.001 mg/L.

The input parameters and model results for MTBE RNA for years 1 through 52 are included in **Appendix E**. As demonstrated by the output included in **Appendix E**, the MTBE contaminant plume in the source area with no degradation and the 1st order decay

model both fall below the maximum contaminant level of 0.013 mg/L for MTBE between year 21 and 22, are at 0.001 mg/L at year 34, with source area MTBE concentrations below 0.001 mg/L at year 35. At year 52, all concentrations within 1,000 feet of the source are below 0.001 mg/L.

6.0 RISK EVALUATION

The risks to human health and the environment from petroleum hydrocarbons, especially BTEX and MTBE, were evaluated from the current data obtained from the Site.

Based on this data, the following observations have been made:

- There are relatively low concentrations of benzene and MTBE in soil and groundwater beneath the Site;
- There is a relatively low estimated mass of benzene (2.12 pounds) and MTBE (14.82 pounds) in soil and groundwater beneath the Site;
- According to the RWQCB, the groundwater beneath the Site does not have a designated beneficial use;
- According to the California Department of Water Resources, there are no identified groundwater production wells within the Site area;
- There is no free product at the Site;
- There is no impact to surface water;
- The soil gas survey demonstrated no health risk from soil vapors;
- Natural attenuation of benzene and MTBE (BIOSCREEN model runs included in this report) at the Site has been demonstrated at the Site.

6.1 Conclusions and Recommendations

The Site has no free product, no potential groundwater use, no impact to surface water, and no health risk from soil vapor. Therefore, based on the risk evaluation presented in this report, GHC has concluded that the Site does not appear to present a risk to human health or the environment, and no cleanup is needed.

Therefore, once the corrective action plan is approved, GHC also recommends abandonment of the existing monitoring wells at the Site in accordance with the County of San Diego well abandonment standards including obtaining proper well abandonment permits.

7.0 REFERENCES

Todd, David, *Groundwater Hydrology – Second Edition*, John Wiley and Sons, New York, 1980.

American Society of Testing and Materials, 1995 (ASTM 1995), *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*, ASTM E-1739-95, Philadelphia, Pa.

SECOR International Inc., December 18, 1997, *Baselining Subsurface Investigation Report, Service Station #116*, 1551 Rosecrans Street, San Diego, California.

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Thrifty Oil Co., January 21, 2003, *Corrective Action Plan, Thrifty Oil Station #116*, 1551 Rosecrans St. and Ingelow St., San Diego, California.

Thrifty Oil Co., December 31, 2003, *Semi Annual Status Report-2nd Half, 2003, Former Thrifty Oil Co. SS #116*, 1551 Rosecrans St., San Diego, California.

GeoHydrologic Consultants, Inc., July 20, 2004, *Semi-Annual Status Report First Half 2004, Former Thrifty Oil Co. Station No.116*, 1551 Rosecrans St., San Diego, California

H&P Mobile Geochemistry, August 2, 2004, *Soil Vapor & Upward Vapor Migration Report, Thrifty Oil Station #116*, 1551 Rosecrans, San Diego, California.

TABLES

TABLE 1
HISTORIC SOIL SAMPLE LABORATORY ANALYTICAL RESULTS
 THRIFTY OIL STATION #116 - SAN DIEGO, CA
 GHC 1223

SAMPLE ID	DATE SAMPLE	ANALYTICAL PARAMETERS					
		TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	MTBE (mg/kg)
D1	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
D2	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
D3	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
D4	06/18/97	1,800	<0.30	38	25	220	<1.0
D5	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
D6	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
D7	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
D8	06/18/97	1,000	<0.15	46	26	160	<6.0
D10	06/18/97	17	<0.050	<0.050	<0.050	<0.15	<1.0
D11	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
D12	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
D13	06/18/97	1,000	0.31	23	7.0	240	<6.0
D14	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
D15	06/18/97	22	<0.050	<0.050	<0.050	0.34	<1.0
D16	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
TDD-1-10	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
TTD-1-25	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
TDD-2/Comp	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
TTD-2-10	06/18/97	39	0.99	3.1	0.97	6.4	<5.0
TTD-2-20	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
TDD-3/Comp 2'	06/18/97	12,000	240	1,600	340	2,200	<1.0
TDD-3-10	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
TDD-3-15	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
TDD-4/Comp 2'	06/18/97	5.9	<0.050	0.23	0.064	0.81	<1.0
TDD-4-10	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
TDD-5/Comp	06/18/97	4.6	0.078	0.056	0.2	0.8	<1.0
TDD-5-5	06/18/97	420	1.4	14	9.5	56	<5.0
TDD-5-25	06/18/97	<10	<0.050	<0.050	<0.050	<0.15	<1.0
PL1-2	12/12/97	6,200	20	49	83	580	NA
PL2-1'3"	12/12/97	5,800	17	75	68	490	NA
PL3-3	12/12/97	25,000	370	1,800	630	3,100	NA
PL4-2.5	12/12/97	3,500	5.5	72	69	450	NA
PL5-2.5	12/12/97	3,400	11	0.85	56	380	NA
PL6-2'8"	12/12/97	2,300	7.6	55	35	170	NA
MW1-5	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW1-6.5	08/28/98	70	<0.03	0.33	0.71	5.3	<0.50
MW1-8.5	08/28/98	4.5	<0.005	<0.005	0.039	0.36	<0.02
MW1-10	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW1-11.5	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW1-13.5	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW1-15	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW1-16.5	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW1-18.5	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW1-25	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02

TABLE 1
HISTORIC SOIL SAMPLE LABORATORY ANALYTICAL RESULTS
THRIFTY OIL STATION #116 - SAN DIEGO, CA
GHC 1223

SAMPLE ID	DATE SAMPLE	ANALYTICAL PARAMETERS					
		TPHg (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	MTBE (mg/kg)
MW2-5	08/28/98	1,300	1.7	53	38	230	0.59
MW2-6.5	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW2-8.5	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW2-13	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW2-20	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW2-25	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW3-5	08/28/98	330	<0.03	2.6	4.0	26	<0.50
MW3-6.5	08/28/98	1.9	<0.005	<0.005	<0.005	0.011	<0.02
MW3-8.5	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	0.044
MW3-13	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	0.28
MW3-20	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW3-25	08/28/98	<1.0	<0.005	<0.005	<0.005	<0.01	<0.02
MW4-5	03/23/00	<1.0	0.0842	0.0697	<0.01	<0.02	0.0266
MW4-10	03/23/00	<1.0	<0.01	0.0128	<0.01	<0.02	<0.01
MW4-15	03/23/00	<1.0	<0.01	<0.01	<0.01	<0.02	<0.01
MW5-5	03/23/00	<1.0	<0.01	<0.01	<0.01	<0.02	<0.01
MW5-10	03/23/00	<1.0	<0.01	<0.01	<0.01	<0.02	<0.01
MW6-5	03/23/00	<1.0	<0.01	<0.01	<0.01	<0.02	<0.01
MW7D-3	03/07/04	290	<0.50	<0.50	<0.50	1.02	<0.50
MW7D-5	03/07/04	444	<0.50	<0.50	0.508	2.18	<0.50
MW7D-7	03/07/04	<5.0	<0.50	<0.50	<0.50	<0.50	<0.50
MW7D-9	03/07/04	<5.0	<0.50	<0.50	<0.50	<0.50	<0.50
MW7D-10	03/07/04	873	2.17	21.4	15.8	92.8	<0.50
MW7D-15	03/07/04	<5.0	<0.50	0.751	0.53	3.22	<0.50
MW7D-20	03/07/04	<5.0	<0.50	<0.50	<0.50	<0.50	0.198

NOTES:

ND = Non-detectable

Analysis for these analytes not conducted during this period

TPHg = Total petroleum hydrocarbons expressed as gasoline

"<" = Less than the laboratory detection limit

" * " = Sample analysis performed outside of the holding period

NA = Sample not analyzed

TABLE 2A
GROUNDWATER DATA
THRIFTY OIL STATION #116 SAN DIEGO, CA.
GHC 1223

DATE SAMPLED	ANALYTICAL PARAMETERS					DEPTH TO GROUNDWATER (feet)	DEPTH TO PRODUCT (feet)	PRODUCT THICKNESS (feet)	CASING ELEVATION (feet)	GROUNDWATER ELEVATION (feet)
	TPH ($\mu\text{g/L}$)	BENZENE ($\mu\text{g/L}$)	TOLUENE ($\mu\text{g/L}$)	EthylBenzene ($\mu\text{g/L}$)	XYLENE ($\mu\text{g/L}$)					
<i>MONITORING WELL # MW-1</i>										
09/22/98	3,800	1,500	350	80	300	170	-	-	-	-
12/10/98	1,300	600	24	<3	49	190	62	8.20	NP	0.00
03/11/99	210	1.6	<0.3	<0.3	0.85	160	-	8.33	NP	0.00
05/12/99	440	0.34	0.68	<0.3	4.7	260	290	8.25	NP	0.00
09/22/99	210	0.77	<0.3	<0.3	<0.5	200	120	8.42	NP	0.00
12/08/99	95	<0.3	<0.3	<0.3	4.8	62	93	8.24	NP	0.00
03/08/00	425	220	37.3	24	47	133	112	7.99	NP	0.00
06/21/00	143	10	1	5	1	78	-	8.10	NP	0.00
11/02/00	246	58	29 J	5.9	3.5 J	-	28	8.02	NP	0.00
05/15/01	193	31	29 J	3.4 J	7.9	-	54	8.62	NP	0.00
11/13/01	119	36	<0.2	4.4 J	7.7	-	32	8.03	NP	0.00
05/22/02	<50	6.2	<0.2	<0.2	<0.4	-	15	8.30	NP	0.00
11/12/02	<50	8.4	<0.18	<0.17	<0.4	-	34	8.12	NP	0.00
05/13/03	99	4.7	<0.32	<0.31	<0.4	-	12	8.35	NP	0.00
11/11/03	82	7.3	<0.32	<0.31	<0.4	-	16	8.22	NP	0.00
05/19/04	69	10	<0.32	1.2 J	<0.4	-	15	8.50	NP	0.00
<i>MONITORING WELL # MW-2</i>										
09/22/98	9,800	1,000	300	350	1,500	8,400	-	-	NP	0.00
12/10/98	3,400	480	26	<3	210	2,000	1,100	5.85	NP	0.00
03/11/99	2,200	230	15	<3	65	2,100	-	5.92	NP	0.00
05/12/99	3,500	68	21	<0.6	69	2,500	3,100	5.71	NP	0.00
09/22/99	4,700	550	26	1.8	130	3,300	2,800	5.76	NP	0.00
12/08/99	3,000	400	23	2.9	73	3,300	3,800	5.80	NP	0.00
03/08/00	7,150	353	78	50.4	56	4,450	2,570	7.50	NP	0.00
06/21/00	17,600	2,060	25	166	253	6,950	5,390	5.65	NP	0.00
11/02/00	2,640	320	3.6 J	51	11	-	2,330	5.57	NP	0.00
05/15/01	5,990	859	6.8	82	44	-	4,820	6.23	NP	0.00
11/13/01	4,020	464	<2.0	44 J	<4.0	-	3,230	5.62	NP	0.00
05/22/02	4,350	536	<10	<10	<20	-	1,150	5.98	NP	0.00
11/12/02	3,400	292	<1.8	<1.7	<4.0	-	2,540	5.75	NP	0.00
05/13/03	4,420	453	<16	<15.5	<20	-	3,220	5.83	NP	0.00

TABLE 2A
GROUNDWATER DATA
THRIFTY OIL STATION # 116 SAN DIEGO, CA.
GHC 1223

DATE SAMPLED	ANALYTICAL PARAMETERS					DEPTH TO GROUNDWATER (feet)	DEPTH TO PRODUCT (feet)	PRODUCT THICKNESS (feet)	CASING ELEVATION (feet)	GROUNDWATER ELEVATION (feet)
	TPH ($\mu\text{g/L}$)	BENZENE ($\mu\text{g/L}$)	TOLUENE ($\mu\text{g/L}$)	EthyBenzene ($\mu\text{g/L}$)	XYLENE ($\mu\text{g/L}$)					
11/11/03	3.440	<22	<32	<31	<40	-	2,790	5.81	NP	0.00
05/19/04	2.950	73	<16	<15.5	<20	-	2,520	6.72	NP	0.00

MONITORING WELL # MW-3	Screen Interval = 10 to 24 feet					Depth to Groundwater (feet)	Depth to Product (feet)	Product Thickness (feet)	Casing Elevation (feet)	Groundwater Elevation (feet)
	TPH ($\mu\text{g/L}$)	BENZENE ($\mu\text{g/L}$)	TOLUENE ($\mu\text{g/L}$)	EthyBenzene ($\mu\text{g/L}$)	XYLENE ($\mu\text{g/L}$)					
09/22/98	4,900	580	16	8.4	44	8,400	5,500	-	-	-
12/10/98	16,000	5,600	62	25	68	18,000	11,000	6.09	NP	0.00
03/11/99	6,900	5.5	<3	4.7	<5	13,000	-	6.29	NP	0.00
05/12/99	7,900	10	<3	<3	7.1	13,000	15,000	6.91	NP	0.00
09/22/99	7,400	4.4	<3	<3	6.3	17,000	17,000	6.74	NP	0.00
12/08/99	5,900	40	6.7	<6	<10	12,000	17,000	6.75	NP	0.00
03/08/00	20,200	81.2	10.7	8.8	19.3	19,200	12,700	6.75	NP	0.00
06/21/00	16,300	498	80	29	168	16,500	17,200	6.36	NP	0.00
11/02/00	2,350	329	11	39	23	-	9,900	6.12	NP	0.00
05/15/01	9,060	453	45	42	128	-	13,000	6.73	NP	0.00
11/13/01	6,400	114	<10	<10	<20	-	12,600	6.44	NP	0.00
05/22/02	5,000	<7.5	<5.0	<5.0	<10	-	5,190	6.45	NP	0.00
11/12/02	8,610	54	<1.8	<1.7	<4.0	-	6,790	6.25	NP	0.00
05/13/03	3,860	44	<3.2	<3.1	<4.0	-	6,710	6.46	NP	0.00
11/11/03	5,860	<11	<16	<15.5	<20	-	4,850	6.39	NP	0.00
05/19/04	4,370	11	<3.2	<3.1	<4.0	-	3,520	6.18	NP	0.00

MONITORING WELL # MW-4	Screen Interval = 10 to 25 feet					Depth to Groundwater (feet)	Depth to Product (feet)	Product Thickness (feet)	Casing Elevation (feet)	Groundwater Elevation (feet)
	TPH ($\mu\text{g/L}$)	BENZENE ($\mu\text{g/L}$)	TOLUENE ($\mu\text{g/L}$)	EthyBenzene ($\mu\text{g/L}$)	XYLENE ($\mu\text{g/L}$)					
06/21/00	100	11	<0.3	<0.3	1	233	263	8.45	NP	0.00
11/02/00	<50	<0.3	<0.2	<0.2	<0.4	-	154	8.37	NP	0.00
05/15/01	138	<0.3	<0.2	<0.2	<0.4	-	138	8.98	NP	0.00
11/13/01	116	<0.3	<0.2	<0.2	<0.4	-	171	8.41	NP	0.00
05/22/02	144	<0.3	<0.2	<0.2	<0.4	-	96	8.68	NP	0.00
11/12/02	177	<0.08	<0.18	<0.17	<0.4	-	175	8.55	NP	0.00
05/13/03	217	<0.22	<0.32	<0.31	<0.4	-	238	8.70	NP	0.00
11/11/03	244	<0.22	<0.32	<0.31	<0.4	-	175	8.63	NP	0.00
05/19/04	131	<0.22	<0.32	<0.31	<0.4	-	139	8.95	NP	0.00

MONITORING WELL # MW-5	Screen Interval = 7 to 22 feet					Depth to Groundwater (feet)	Depth to Product (feet)	Product Thickness (feet)	Casing Elevation (feet)	Groundwater Elevation (feet)
	TPH ($\mu\text{g/L}$)	BENZENE ($\mu\text{g/L}$)	TOLUENE ($\mu\text{g/L}$)	EthyBenzene ($\mu\text{g/L}$)	XYLENE ($\mu\text{g/L}$)					
06/21/00	<50	<0.3	<0.3	<0.3	<0.3	233	263	8.45	NP	0.00
11/02/00	<50	<0.3	<0.2	<0.2	<0.4	-	154	8.37	NP	0.00

TABLE 2A
GROUNDWATER DATA
THRIFTY OIL STATION # 116 SAN DIEGO, CA.
GHC 1223

DATE SAMPLED	ANALYTICAL PARAMETERS						DEPTH TO GROUNDWATER (feet)	DEPTH TO PRODUCT (feet)	PRODUCT THICKNESS (feet)	CASING ELEVATION (feet)	GROUNDWATER ELEVATION (feet)
	TPH ($\mu\text{g/L}$)	BENZENE ($\mu\text{g/L}$)	TOLUENE ($\mu\text{g/L}$)	EthyBenzene ($\mu\text{g/L}$)	XYLENE ($\mu\text{g/L}$)	MTBE ($\mu\text{g/L}$)					
05/15/01	<50	<0.3	<0.2	<0.2	<0.4	-	2.2	6.18	NP	0.00	7.954
11/13/01	<50	<0.3	<0.2	<0.2	<0.4	-	2	5.40	NP	0.00	7.954
05/22/02	<50	<0.3	<0.2	<0.2	<0.4	-	1.7	5.80	NP	0.00	7.954
11/12/02	<50	<0.08	<0.18	<0.17	<0.4	-	1.4	5.50	NP	0.00	7.954
05/13/03	<15	<0.22	<0.32	<0.31	<0.4	-	<0.18	5.60	NP	0.00	7.954
11/11/03	<15	<0.22	<0.32	<0.31	<0.4	-	<0.18	5.58	NP	0.00	7.954
05/19/04	<15	<0.22	<0.32	<0.31	<0.4	-	<0.18	6.08	NP	0.00	7.954

MONITORING WELL # MW-6

DATE SAMPLED	Screen Interval = 5 to 20 feet						DEPTH TO GROUNDWATER (feet)	DEPTH TO PRODUCT (feet)	PRODUCT THICKNESS (feet)	CASING ELEVATION (feet)	GROUNDWATER ELEVATION (feet)
	TPH ($\mu\text{g/L}$)	BENZENE ($\mu\text{g/L}$)	TOLUENE ($\mu\text{g/L}$)	EthyBenzene ($\mu\text{g/L}$)	XYLENE ($\mu\text{g/L}$)	MTBE ($\mu\text{g/L}$)					
06/21/00	<50	<0.3	<0.3	<0.3	<0.6	<5	-	3.88	NP	0.00	6.121
11/02/00	<50	<0.3	<0.2	<0.2	<0.4	-	<0.6	3.86	NP	0.00	6.121
05/15/01	<50	<0.3	<0.2	<0.2	<0.4	-	<0.6	4.41	NP	0.00	6.121
11/13/01	<50	<0.3	<0.2	<0.2	<0.4	-	1.1	3.78	NP	0.00	6.121
05/22/02	<50	<0.3	<0.2	<0.2	<0.4	-	<0.6	4.13	NP	0.00	6.121
11/12/02	<50	<0.08	<0.18	<0.17	<0.4	-	1.8	3.91	NP	0.00	6.121
05/13/03	<15	<0.22	<0.32	<0.31	<0.4	-	2.5	4.15	NP	0.00	6.121
11/11/03	<15	<0.22	<0.32	<0.31	<0.4	-	3.2	4.45	NP	0.00	6.121
05/19/04	<15	<0.22	<0.32	<0.31	<0.4	-	1.9	4.40	NP	0.00	6.121

MONITORING WELL # MW-7 (on 05/01 identified as well #4)

DATE SAMPLED	Screen Interval = 5 to 20 feet						DEPTH TO GROUNDWATER (feet)	DEPTH TO PRODUCT (feet)	PRODUCT THICKNESS (feet)	CASING ELEVATION (feet)	GROUNDWATER ELEVATION (feet)
	TPH ($\mu\text{g/L}$)	BENZENE ($\mu\text{g/L}$)	TOLUENE ($\mu\text{g/L}$)	EthyBenzene ($\mu\text{g/L}$)	XYLENE ($\mu\text{g/L}$)	MTBE ($\mu\text{g/L}$)					
05/15/01	3,890	695	14	453	96	-	776	7.44	NP	0.00	-
11/13/01	14,200	2,060	662	1,210	1,500	-	1,020	6.86	NP	0.00	-
05/22/02	8,610	800	44 J	406	291	-	593	7.23	NP	0.00	-
11/12/02	5,860	89	22	47	202	-	1,480	7.05	NP	0.00	-
05/13/03	4,300	339	29 J	67	166	-	1,660	7.24	NP	0.00	-
11/11/03	3,880	76	<3.2	25 J	96	-	1,280	7.16	NP	0.00	-
05/19/04	3,340	55	11 J	22 J	92	-	2,080	7.42	NP	0.00	-

TABLE 2A
GROUNDWATER DATA
THRIFTY OIL STATION # 116 SAN DIEGO, CA.
GHC 1223

DATE SAMPLED	ANALYTICAL PARAMETERS					DEPTH TO GROUNDWATER (feet)	DEPTH TO PRODUCT (feet)	PRODUCT THICKNESS (feet)	CASING ELEVATION (feet)	GROUNDWATER ELEVATION (feet)
	TPH ($\mu\text{g/L}$)	BENZENE ($\mu\text{g/L}$)	TOLUENE ($\mu\text{g/L}$)	EthyBenzene ($\mu\text{g/L}$)	XYLENE ($\mu\text{g/L}$)					
MONITORING WELL # TDD-1										
09/22/98	1,700	190	29	140	57	300	-	-	-	-
12/10/98	230	12	0.43	0.70	<0.5	210	140	7.70	NP	0.00
03/11/99	180	<0.3	0.33	0.42	<0.5	230	-	7.81	NP	0.00
05/12/99	620	1.3	0.53	<0.3	1.8	160	140	7.54	NP	0.00
09/22/99	380	2.2	<0.3	<0.3	1.4	170	120	7.57	NP	0.00
12/08/99	680	77	15	40	29	84	100	7.65	NP	0.00
03/08/00	817	31.4	55.7	50	180	122	89.2	7.65	NP	0.00
06/21/00	207	31	3	2	3	30	-	7.73	NP	0.00
11/02/00	116	3.8 J	2 J	8.7	2.3 J	-	194	7.36	NP	0.00
05/15/01	142	11	5.9	4.2 J	14	-	62	8.32	NP	0.00
11/13/01	236	2.9	<0.2	<0.2	<0.4	-	290	7.45	NP	0.00
05/22/02	244	<0.3	<0.2	<0.2	<0.4	-	200	7.80	NP	0.00
11/12/02	178	<0.08	<0.18	<0.17	<0.4	-	140	7.60	NP	0.00
05/13/03	182	<0.22	<0.32	<0.31	<0.4	-	166	7.89	NP	0.00
11/11/03	159	<0.22	<0.32	<0.31	<0.4	-	89	7.65	NP	0.00
05/19/04	101	<0.22	<0.32	<0.31	<0.4	-	84	8.07	NP	0.00

NOTE: NP = No free hydrocarbon product

" = Not Analyzed / Not Available

Benzene, toluene, ethylbenzene, and xylenes analyzed by EPA method 8020.

Total petroleum hydrocarbons (TPH) analyzed by EPA method 8015 modified for gasoline

Methyl-tert Butyl Ether (MTBE) analyzed by EPA method 8020 or 8260

Beginning 11/2/2000, BTX and MTBE analyzed by EPA Method 8260B

TABLE 2B
OXYGENATES DATA IN GROUNDWATER
THRIFTY OIL STATION # 116, SAN DIEGO, CA.
GHC 1223

DATE SAMPLED	ANALYTICAL PARAMETERS			
	Di-isopropyl Ether (DIPE) (ug/L)	Ethyl-Tert-Butyl Ether (ETBE) (ug/L)	Tert-Amyl Methyl Ether (TAME) (ug/L)	Tert-Butyl Alcohol (TBA) (ug/L)
MONITORING WELL # MW-1				
11/02/00	<0.5	<0.7	<0.5	<20
05/15/01	1.4	<0.7	<0.5	<10
11/13/01	<0.5	<0.7	<0.5	<10
05/22/02	<0.5	<0.7	<0.5	<10
11/12/02	1.2	<0.12	<0.16	<10
05/13/03	<0.29	<0.17	<0.28	<10
11/11/03	<0.29	<0.17	<0.28	<10
05/19/04	<0.29	<0.17	<0.28	<10
MONITORING WELL # MW-2				
11/02/00	<0.5	<0.7	<0.5	83
05/15/01	42	<0.7	20	173
11/13/01	24	<7.0	20	386
05/22/02	<25	<35	<25	<500
11/12/02	21	<1.2	<1.6	421
05/13/03	<14.5	<8.5	<14	<500
11/11/03	<29	<17	<28	<1,000
05/19/04	<14.5	<8.5	<14	<500
MONITORING WELL # MW-3				
11/02/00	<0.5	4.5	<0.5	67
05/15/01	10	<0.7	45	334
11/13/01	<25	<35	<25	718
05/22/02	<12.5	<17.5	<12.5	2,160
11/12/02	<2.0	<1.2	24	835
05/13/03	<2.9	<1.7	31	334
11/11/03	<14.5	<8.5	<14	<500
05/19/04	<2.9	<1.7	16	<100
MONITORING WELL # MW-4				
11/02/00	<0.5	<0.7	<0.5	<20
05/15/01	<0.5	<0.7	<0.5	<10
11/13/01	<0.5	<0.7	<0.5	<10
05/22/02	<0.5	<0.7	<0.5	46
11/12/02	<0.2	<0.12	<0.16	23
05/13/03	<0.29	<0.17	<0.28	<10
11/11/03	<0.29	<0.17	<0.28	<10
05/19/04	<0.29	<0.17	<0.28	13
MONITORING WELL # MW-5				
11/02/00	<0.5	<0.7	<0.5	<20
05/15/01	<0.5	<0.7	<0.5	<10
11/13/01	<0.5	<0.7	<0.5	<10
05/22/02	<0.5	<0.7	<0.5	<10
11/12/02	<0.2	<0.12	<0.16	<10
05/13/03	<0.29	<0.17	<0.28	<10

TABLE 2B
OXYGENATES DATA IN GROUNDWATER
THRIFTY OIL STATION # 116, SAN DIEGO, CA.
GHC 1223

DATE SAMPLED	ANALYTICAL PARAMETERS			
	Di-isopropyl Ether (DIPE) (ug/L)	Ethyl-Tert-Butyl Ether (ETBE) (ug/L)	Tert-Amyl Methyl Ether (TAME) (ug/L)	Tert-Butyl Alcohol (TBA) (ug/L)
11/11/03	<0.29	<0.17	<0.28	<10
05/19/04	<0.29	<0.17	<0.28	<10
MONITORING WELL # MW-6:				
11/02/00	<0.5	<0.7	<0.5	<20
05/15/01	<0.5	<0.7	<0.5	<10
11/13/01	<0.5	<0.7	<0.5	<10
05/22/02	<0.5	<0.7	<0.5	<10
11/12/02	<0.2	<0.12	<0.16	<10
05/13/03	<0.29	<0.17	<0.28	<10
11/11/03	<0.29	<0.17	<0.28	<10
05/19/04	<0.29	<0.17	<0.28	<10
MONITORING WELL # MW-7 (on 05/01 identified as well #A)				
05/15/01	5.8	<0.7	<0.5	52
11/13/01	<5.0	<7.0	<5.0	144
05/22/02	<5.0	<7.0	<5.0	226
11/12/02	2.9	<0.12	16	565
05/13/03	<2.9	<1.7	13	<100
11/11/03	<2.9	<1.7	<2.8	<100
05/19/04	<2.9	<1.7	14	305
MONITORING WELL # TDD-1				
11/02/00	<0.5	<0.7	<0.5	1.2
05/15/01	<0.5	<0.7	<0.5	<10
11/13/01	<0.5	<0.7	1.6	15
05/22/02	<0.5	<0.7	<0.5	105
11/12/02	<0.2	<0.12	<0.16	17
05/13/03	2.3	<0.17	<0.28	<10
11/11/03	<0.29	<0.17	<0.28	<10
05/19/04	<0.29	<0.17	<0.28	<10

NOTE: DIPE, ETBE, TAME, TBA analyzed by EPA Method 8260B

TABLE 3
WELL COMPLETION DETAILS
 THRIFTY OIL STATION #116 - SAN DIEGO, CA
 GHC 1223

Well ID	Date Constructed	Total Depth	Casing Diameter	Screen Interval	TOC Elevation *
TDD-1	06/18/97	25.5 ft	2 - inch	7-25 ft	8.82
MW-1	08/28/98	25 ft	2 - inch	10-25 ft	9.58
MW-2	08/28/98	24.5 ft	2 - inch	10-24.5 ft	7.11
MW-3	08/28/98	24 ft	2 - inch	10-24 ft	7.72
MW-4	03/23/00	25 ft	2 - inch	10-25 ft	10.746
MW-5	03/23/00	23 ft	2 - inch	7-22 ft	7.954
MW-6	03/23/00	20 ft	2 - inch	5-20 ft	6.121
MW-7	03/07/01	21.5 ft	2 - inch	5-20 ft	NS

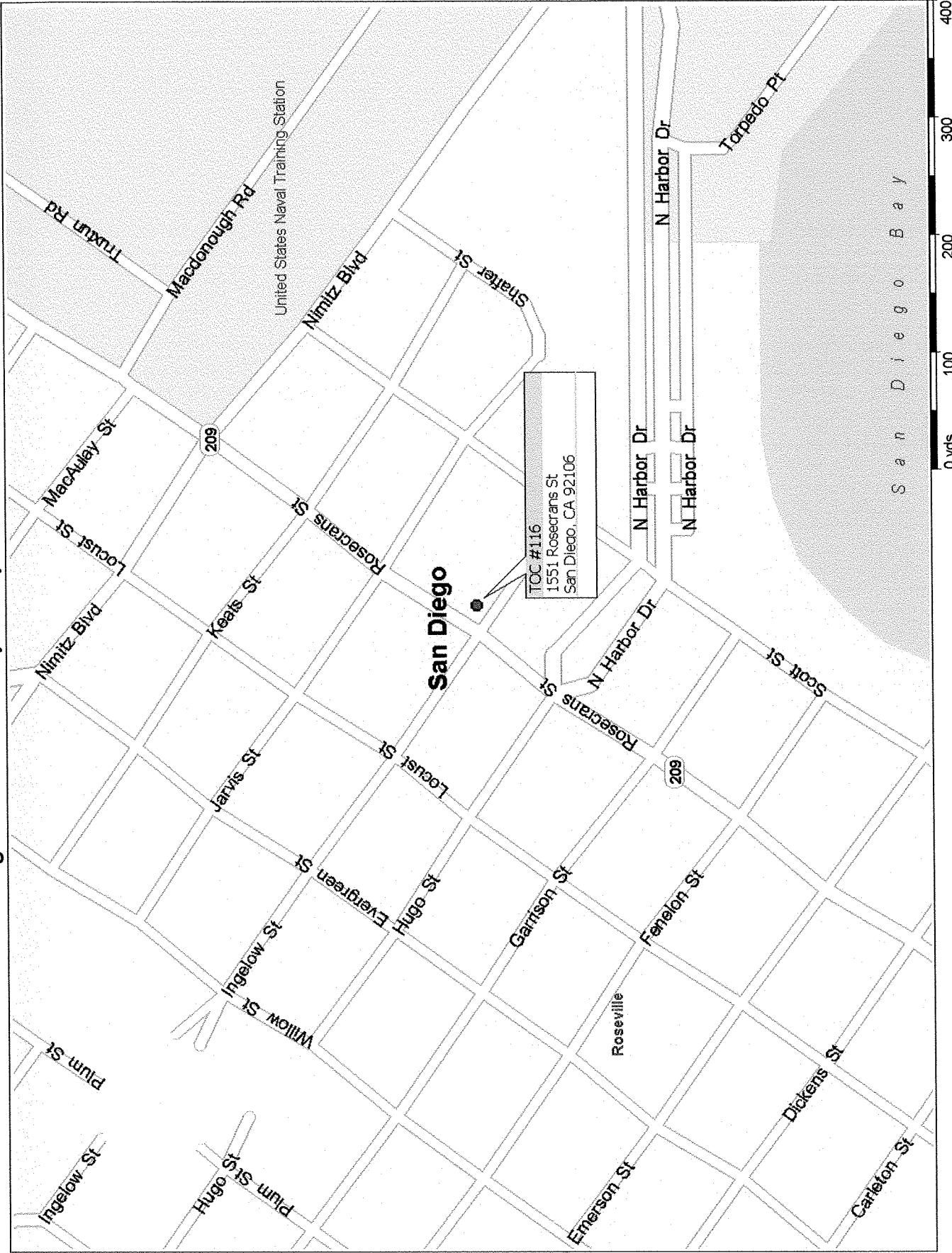
NOTES:

TOC * Top of Casing feet above mean sea level

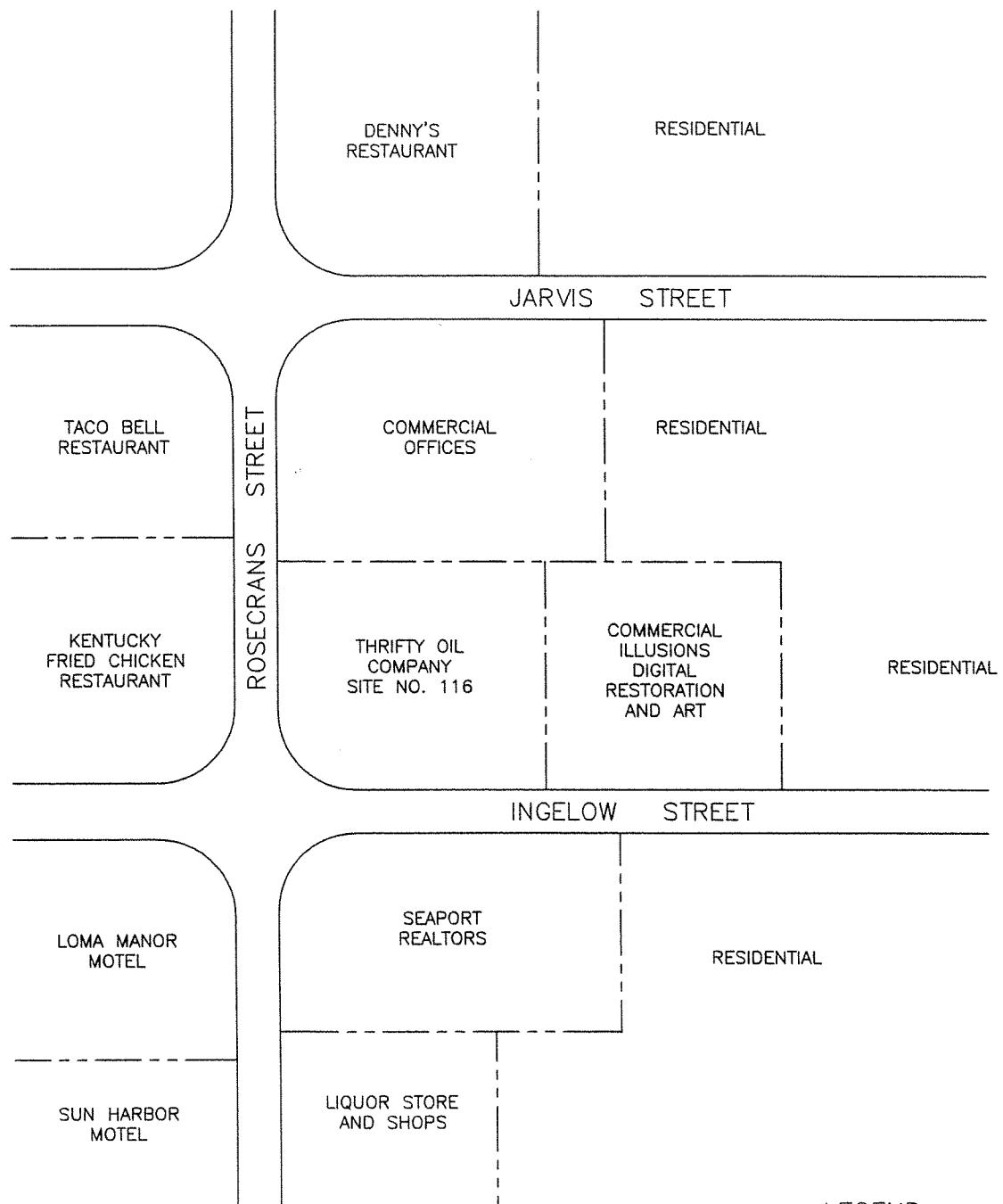
NS Not surveyed

FIGURES

Figure 1: Site Vicinity Thrifty Oil Station #116



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© Copyright 2000 by Geographic Data Technology, Inc. All rights reserved. © 2000 Navigation Technologies. All rights reserved. This data includes information taken with permission from Canadian authorities © Her Majesty the Queen in Right of Canada. © Copyright 2000 by Compusearch Micromarketing Data and Systems Ltd.



LEGEND

NOT TO SCALE

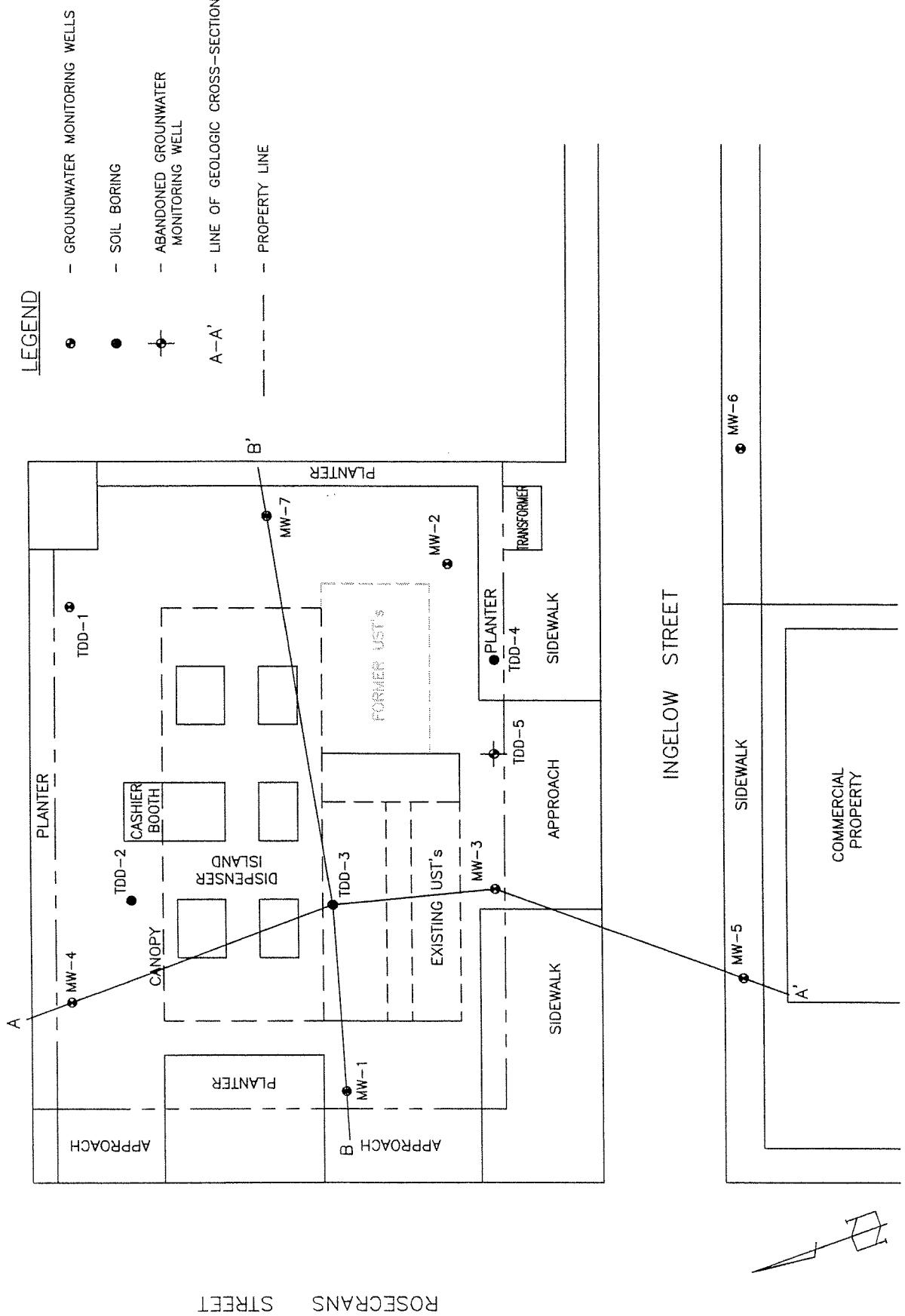
APPROXIMATE PROPERTY LOCATION



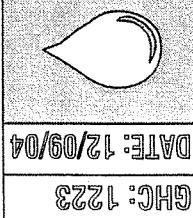
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Costa Mesa, CA 92626
www.geohydrologic.com

NORTH	GHC: 1223	DATE: 12/09/04

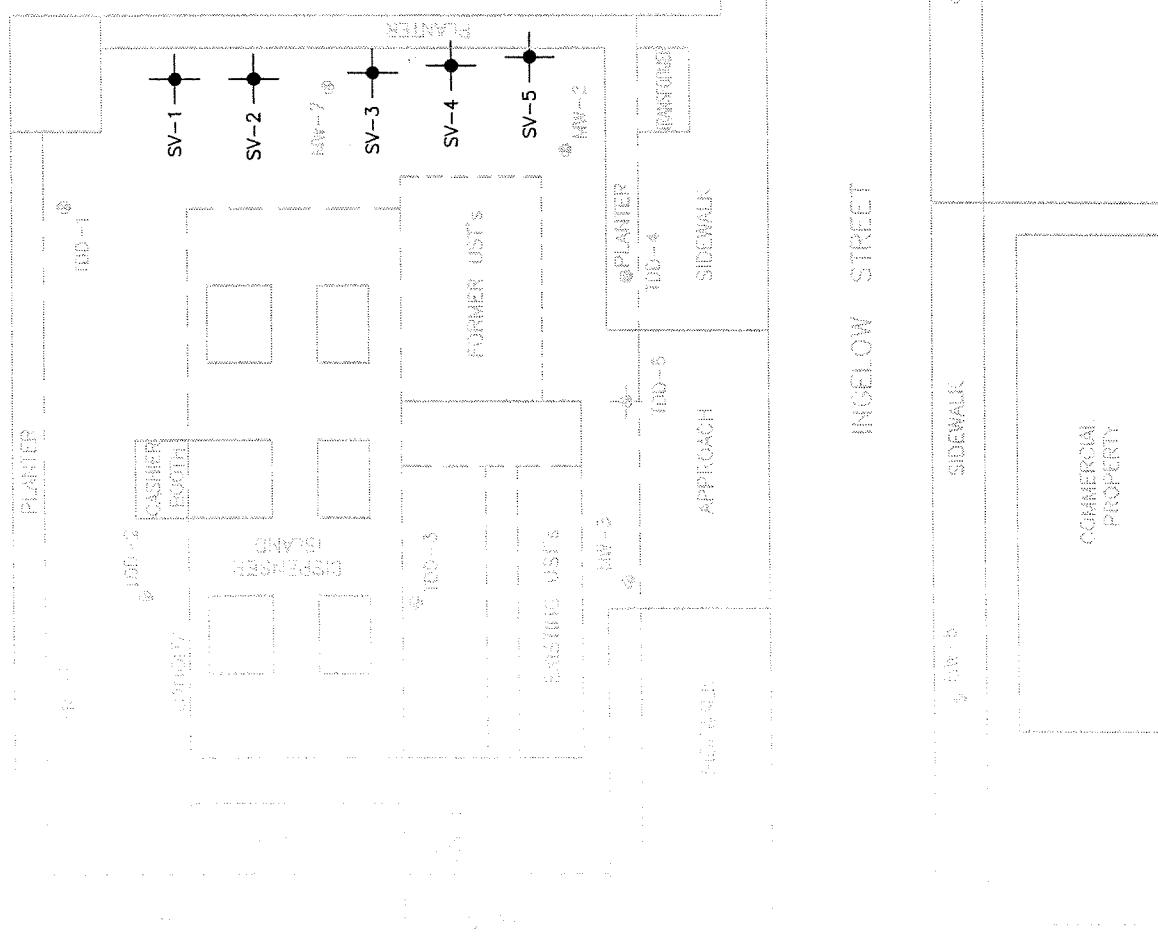
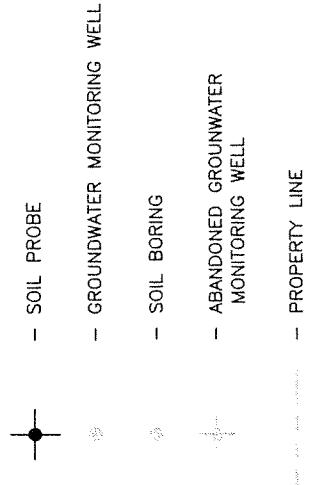
**FIGURE 2
AREA MAP
THRIFTY SERVICE STATION #116
1551 Rosecrans Street
San Diego, CA**



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LEGEND



NORTH

APPROXIMATE SCALE IN FEET
0' 30' 60'

GHC: 1223 DATE: 12/09/04

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COMMERCIAL PROPERTY



HDR-6

NARROW STREET

HDR-3

SIDEWALK

HDR-2

HDR-4

HDR-5

HDR-7

HDR-8

HDR-9

HDR-10

HDR-11

HDR-12

HDR-13

HDR-14

HDR-15

HDR-16

HDR-17

HDR-18

HDR-19

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HDR-286

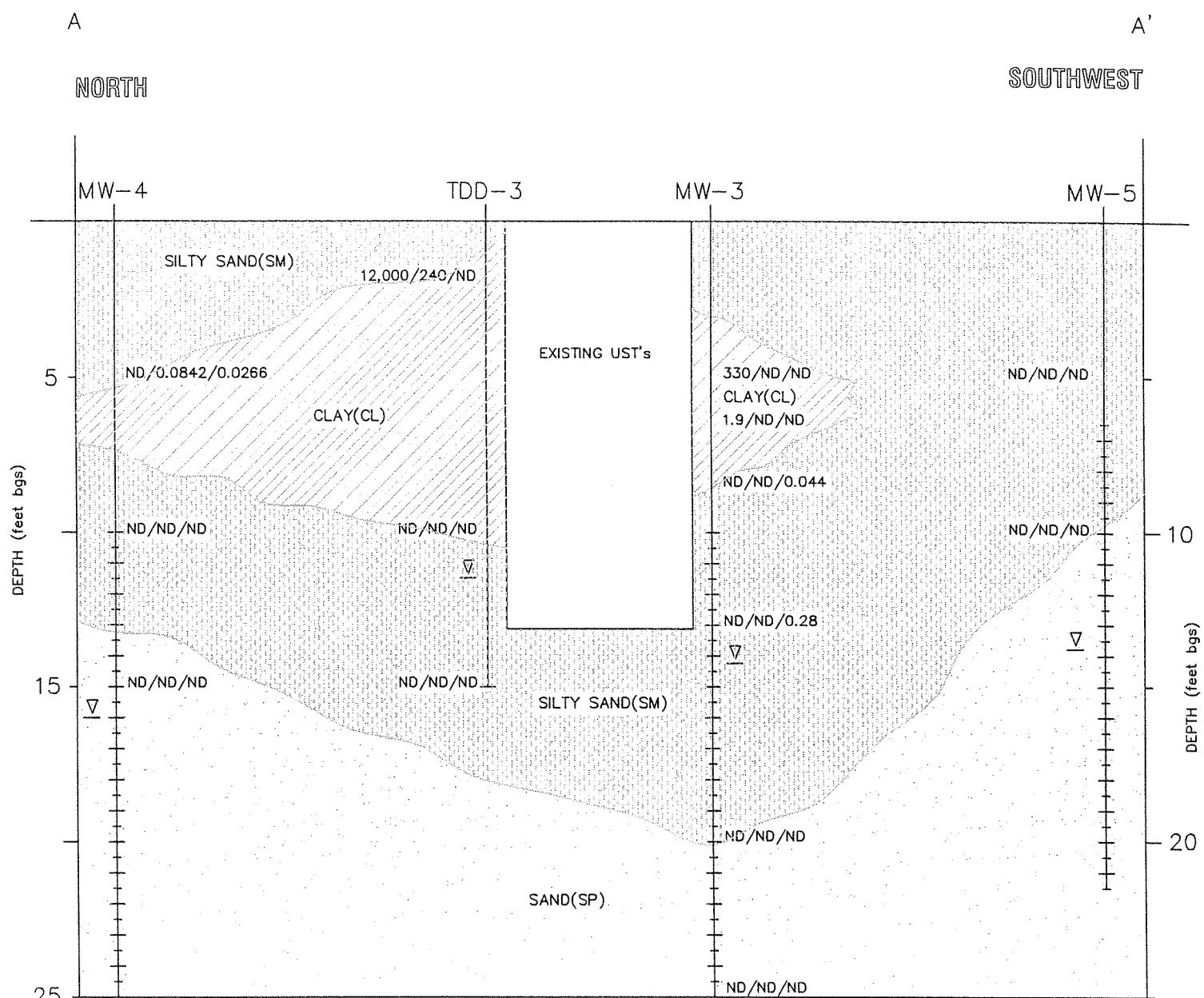
HDR-287

HDR-288

HDR-289

HDR-290

VIEW NORTHEAST

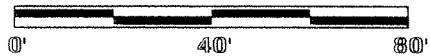


LEGEND

- ▽ - FIRST ENCOUNTERED GROUNDWATER
- ND/ND/ND - TPH_g/BENZENE/MTBE CONCENTRATIONS IN (mg/Kg)
- ND - NOT DETECTED ABOVE LABORATORY REPORTING LIMITS
- NA - NOT ANALYZED

HORIZONTAL 1"=40'
VERTICAL 1"=5'

APPROXIMATE SCALE IN FEET

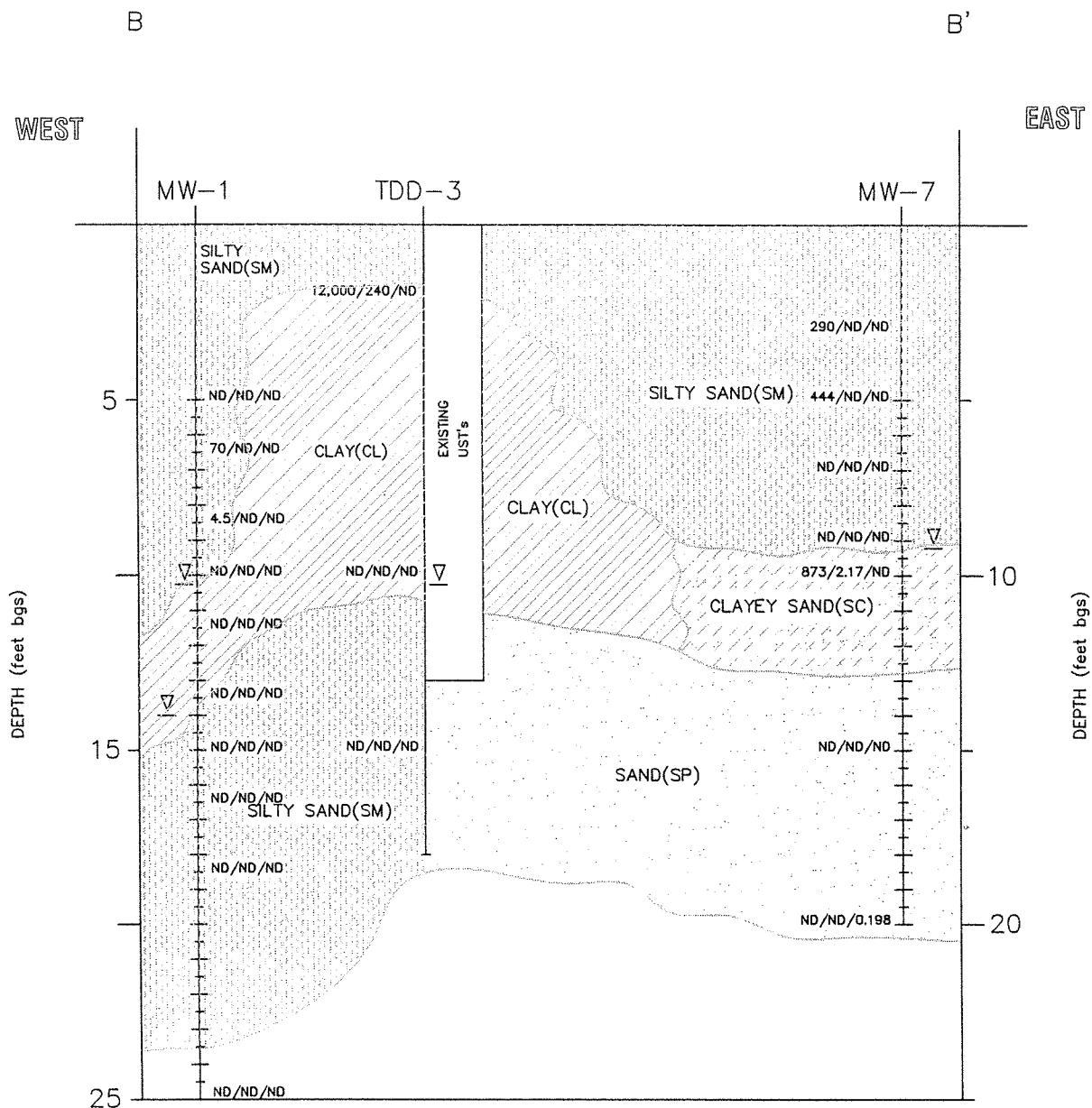


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DATE: 12/09/04

FIGURE 4A
GEOLOGIC CROSS-SECTION A-A'
THRIFTY SERVICE STATION #116
1551 Rosecrans Street
San Diego, CA

VIEW NORTH

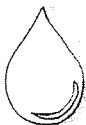
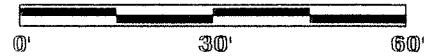


LEGEND

- ▽ - FIRST ENCOUNTERED GROUNDWATER
- ND/ND/ND - TPH_q/BENZENE/MTBE CONCENTRATIONS IN (mg/Kg)
- ND - NOT DETECTED ABOVE LABORATORY REPORTING LIMITS
- NA - NOT ANALYZED

HORIZONTAL 1" = 30'
VERTICAL 1" = 5'

APPROXIMATE SCALE IN FEET

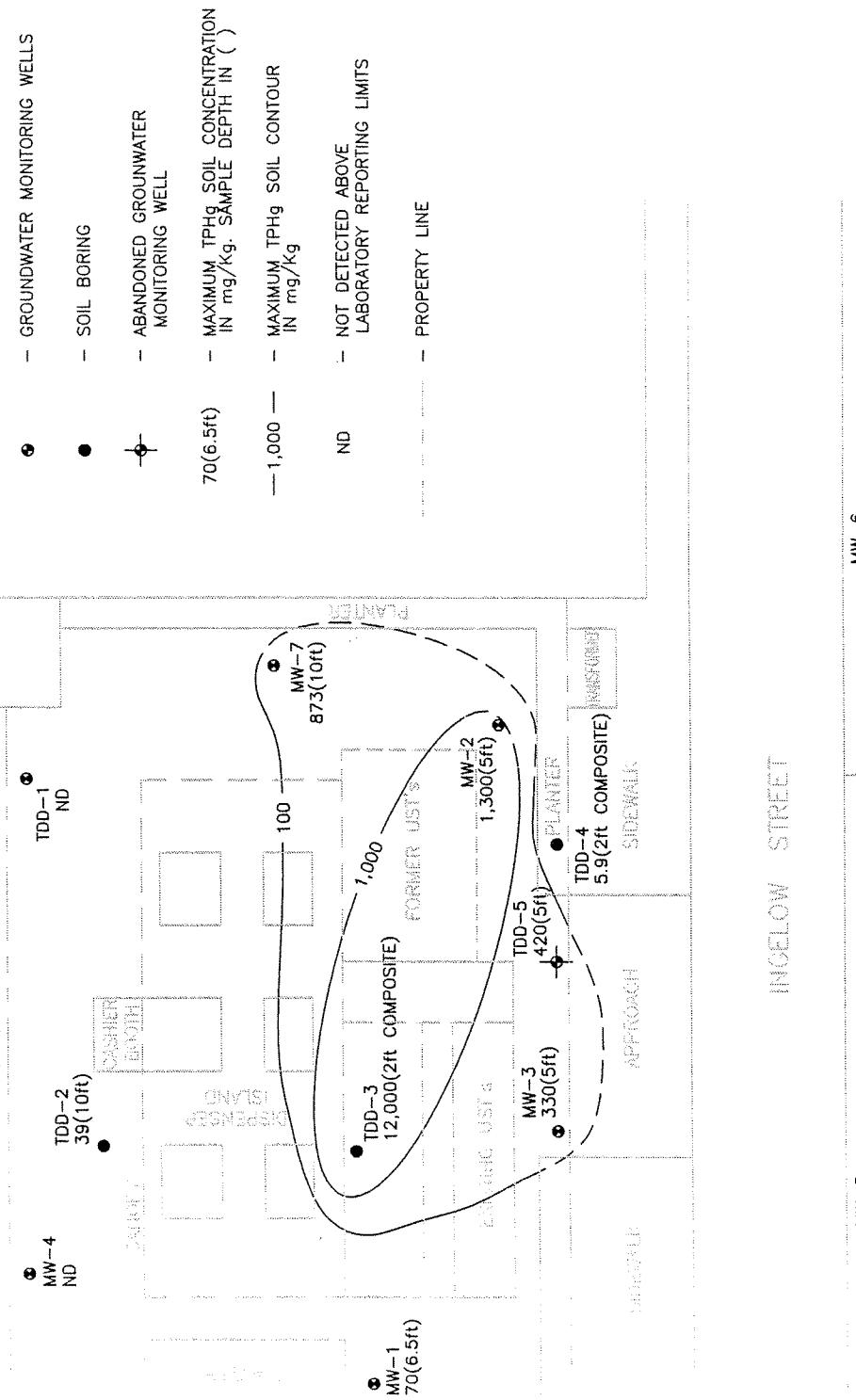


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FIGURE 4B
GEOLOGIC CROSS-SECTION B-B'
THRIFTY SERVICE STATION #116
1551 Rosecrans Street
San Diego, CA

LEGEND



NORTH

APPROXIMATE SCALE IN FEET
30' 60'

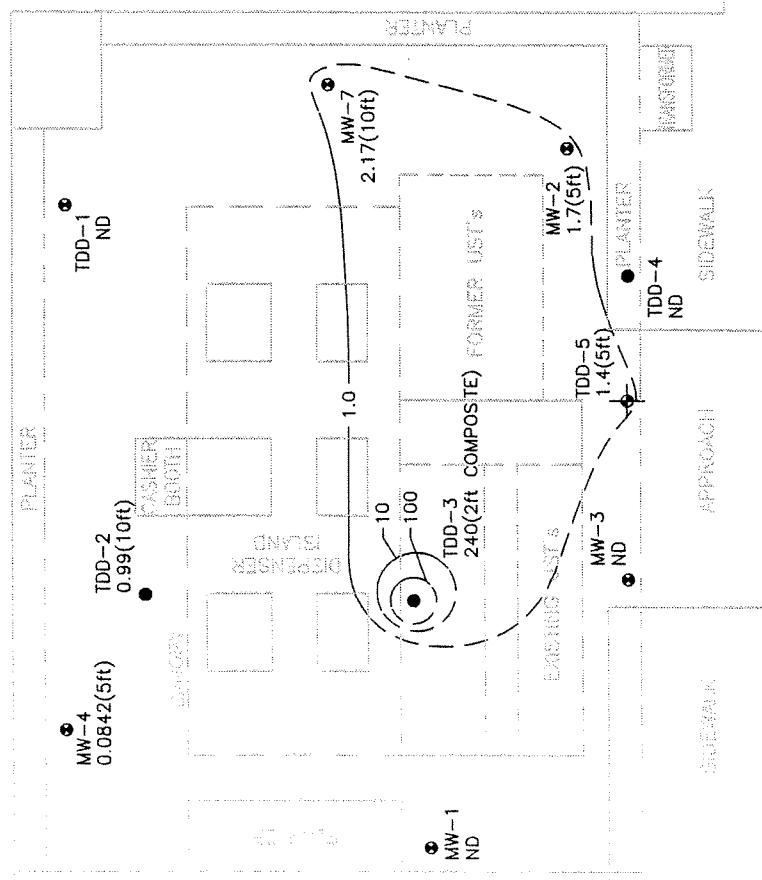
GHC: 1223 DATE: 12/09/04

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FIGURE 5A
DISTRIBUTION OF TPHg IN SOIL
THRIFTY SERVICE STATION #116
1551 Rosecrans Street
San Diego, CA

LEGEND

●	- GROUNDWATER MONITORING WELLS
●	- SOIL BORING
●	- ABANDONED GROUNDWATER MONITORING WELL
2.17(10ft)	- MAXIMUM BENZENE SOIL CONCENTRATION IN mg/Kg. SAMPLE DEPTH IN ()
ND	- 100 - - MAXIMUM BENZENE SOIL CONTOUR IN mg/Kg
ND	- NOT DETECTED ABOVE LABORATORY REPORTING LIMITS
	- PROPERTY LINE

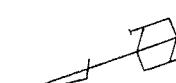


IN BELOW STREET

MW-6
NDMW-5
NDCURBSTONE
PARKING

NORTH

APPROXIMATE SCALE IN FEET
30'

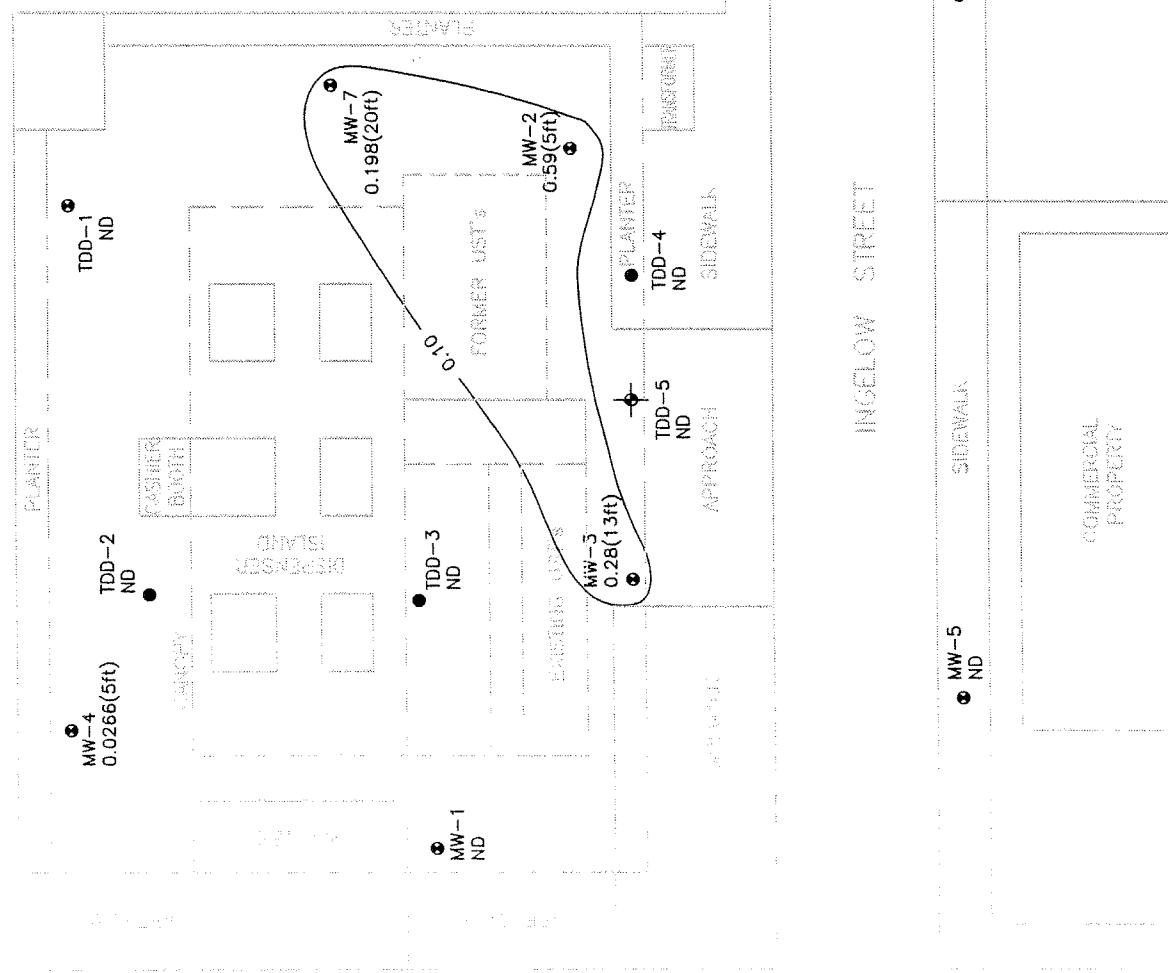


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FIGURE 5B
DISTRIBUTION OF BENZENE in SOIL
THRIFTY SERVICE STATION #116
1551 Rosecrans Street
San Diego, CA

LEGEND

- — GROUNDWATER MONITORING WELLS
- — SOIL BORING
- — ABANDONED GROUNDWATER MONITORING WELL
- 0.28(13ft) — MAXIMUM MTBE SOIL CONCENTRATION IN mg/Kg. SAMPLE DEPTH IN (')
- 0.10 — — MAXIMUM MTBE SOIL CONTOUR IN mg/Kg
- ND — NOT DETECTED ABOVE LABORATORY REPORTING LIMITS
- PROPERTY LINE



NORTH

APPROXIMATE SCALE IN FEET
30'
0'

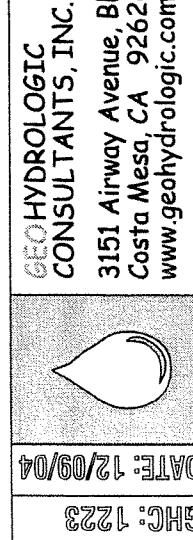
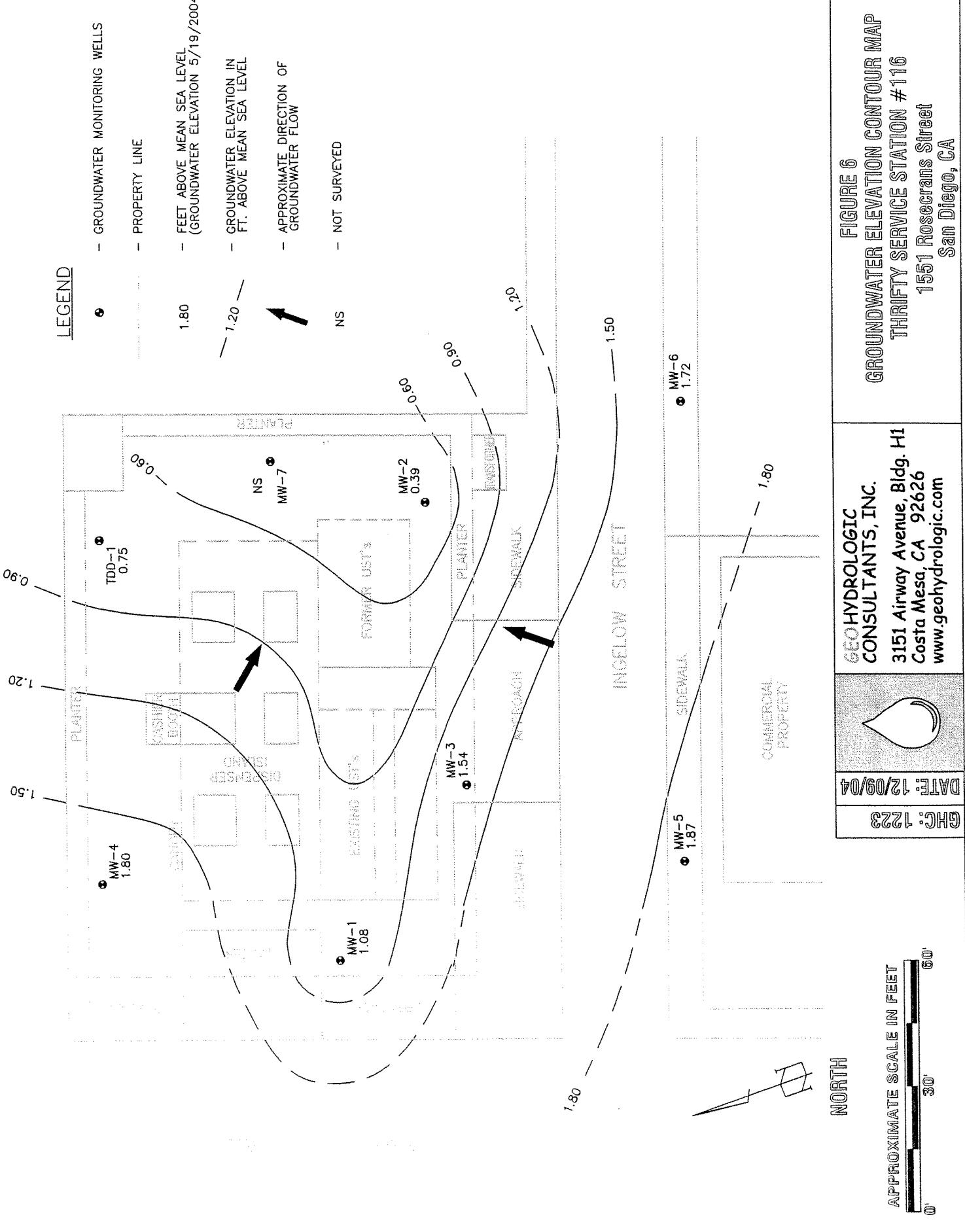


FIGURE 5C
DISTRIBUTION OF MTBE in SOIL
THRIFTY SERVICE STATION #116
1551 Rosecrans Street
San Diego, CA



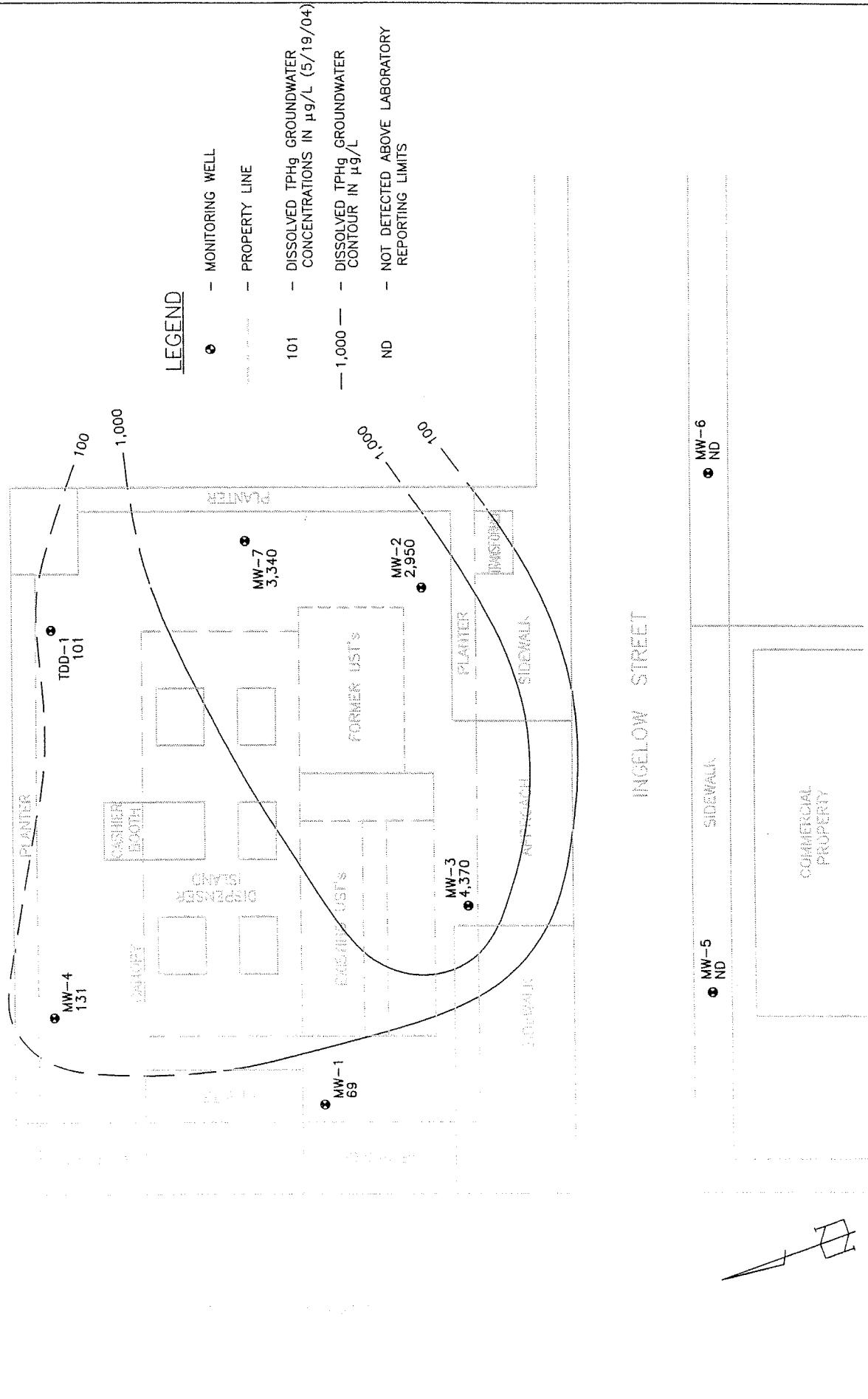


FIGURE 7A
N of TPhg in GROUNDWATER
SERVICE STATION #116
 11 Rosecrans Street
 San Diego, CA

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GHC: 1223

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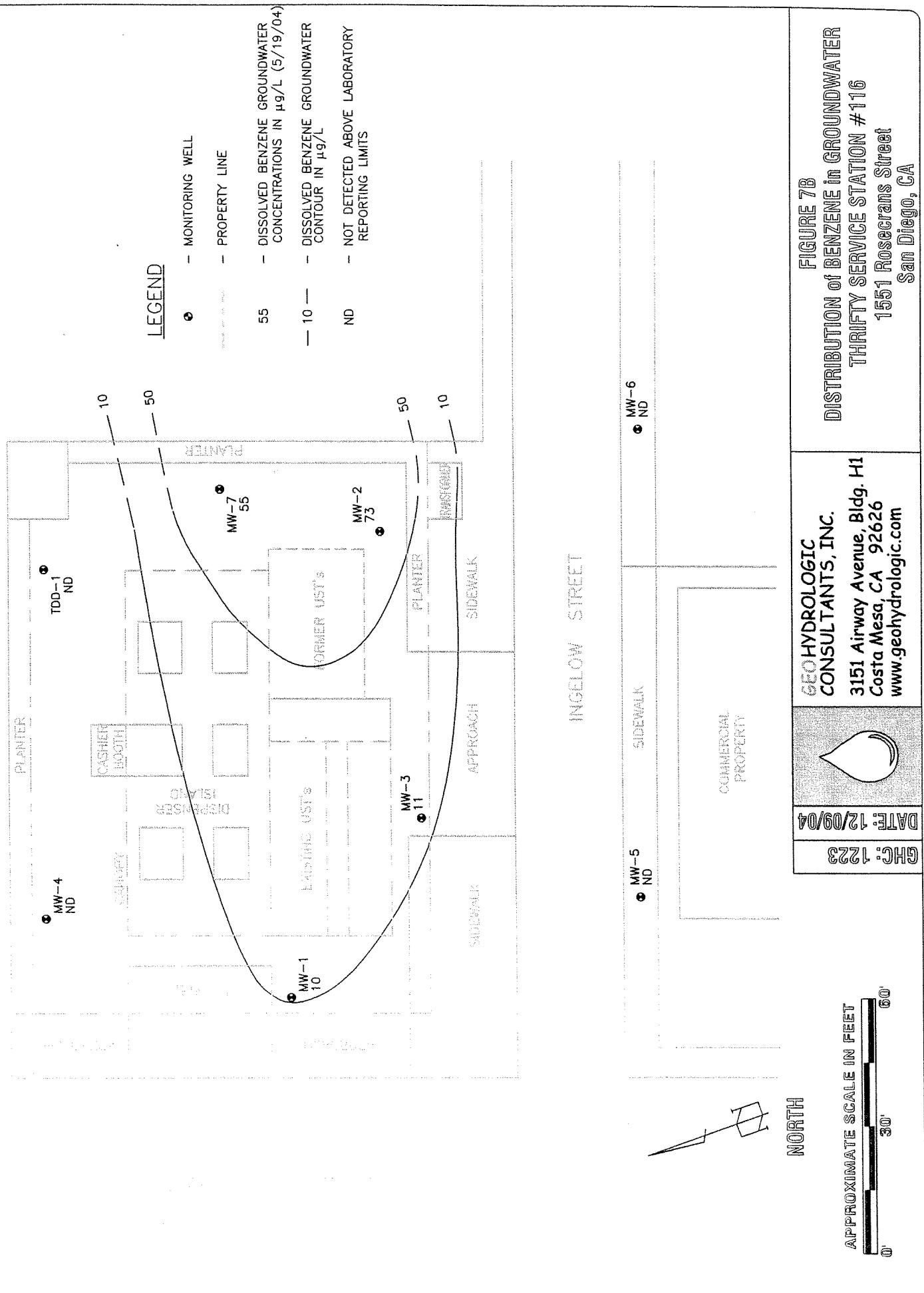
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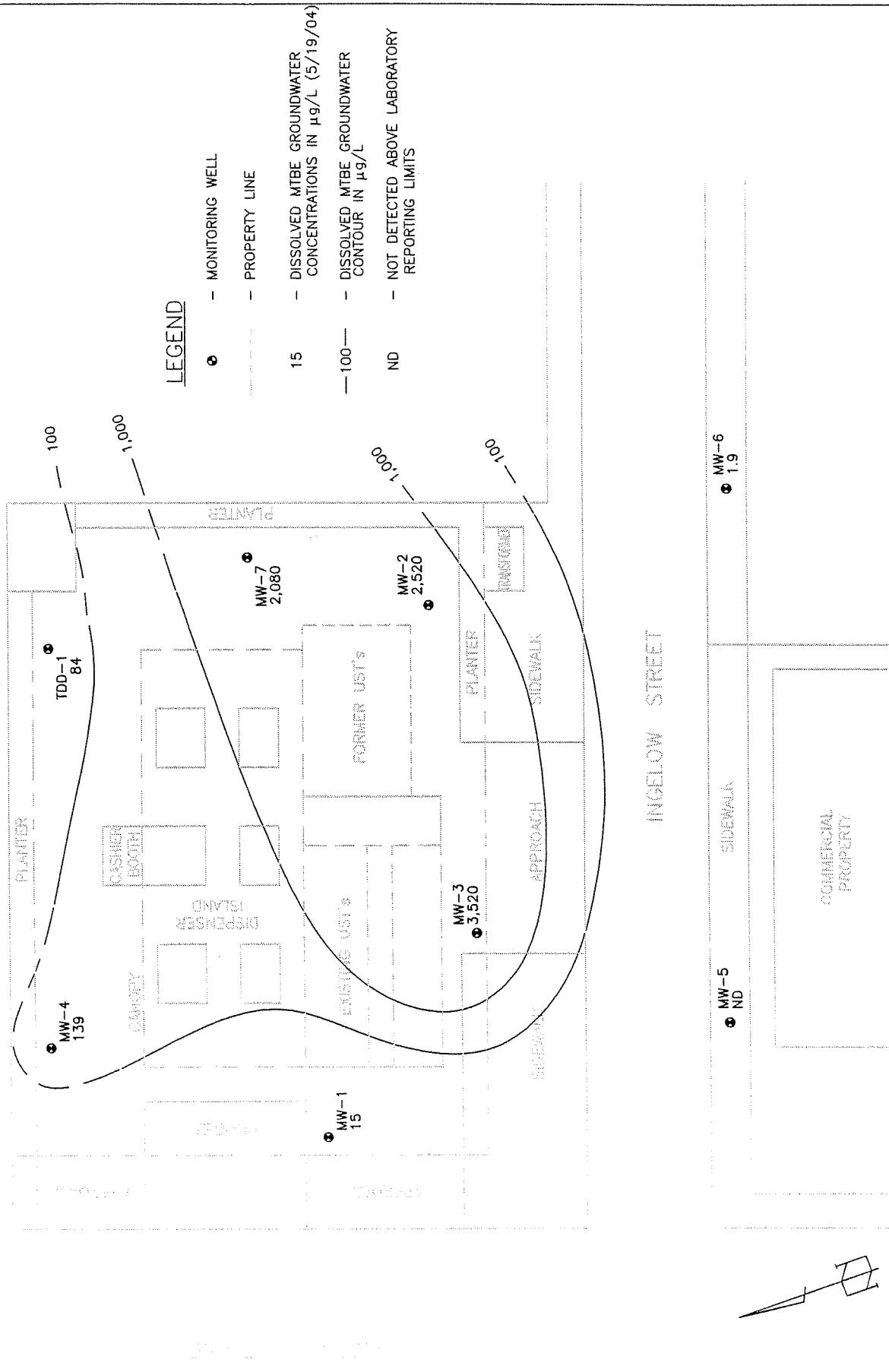


FIGURE 7C
DISTRIBUTION of MTBE in GROUNDWATER
THRIFTY SERVICE STATION #116
1551 Rosecrans Street
San Diego, CA

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DATE: 12/09/04
GHG: 1-222

APPENDICES

APPENDIX A

Buried Utility Maps for the Site

Legend

- Roads
- Forests
- Water Service
- Water Tanks
- Water Mains
- Sewer Lines
- Sewer Lateral
- Storm Drains
- Storm Drains



1:600

Vicinity Map



Map scale: 1:600
Scale bar: 100m
Elevation: 100m
Aspect: NNE
Orientation: North

APPENDIX B

H&P Mobile Geochemistry Soil Vapor & Upward Migration Report

THRIFTY OIL CO.

September 2, 2004

O-49676

Mr. David Felix
Site Assessment and Mitigation Program
Department of Environmental Health
County of San Diego
P.O. Box 129261
San Diego, CA 92112-9261

Re: Thrifty Oil Co. Station #116
1551 Rosecrans Street
San Diego, California
CSDDEH SAM ID No. H14829-002
Global ID No. T0607302341

Subject: Soil Vapor and Upward Vapor Migration Report

Dear Mr. Felix:

Enclosed please find the Soil Vapor and Upward Vapor Migration Report, dated August 2, 2004, prepared by H & P Mobile Geochemistry for Thrifty Oil Co.(Thrifty) Station #116 located at 1551 Rosecrans Street in San Diego, California. The subject report was required by the SDDEH-SAM in its letter dated June 8, 2004, and the activities were performed in accordance with requirements specified in the June 8, 2004 letter.

If you should have any questions or comments regarding this transmittal, please contact Larry Higinbotham or myself at (562) 921-3581.

Sincerely,



Chris Panaitescu,
General Manager
Environmental Affairs

cc: BP/ARCO Products Company
File



13116 Imperial Highway, Santa Fe Springs, CA 90670 • (562) 921-3581

August 2, 2004

Mr. Larry Higinbotham
Thrifty Oil Co.
13116 Imperial Highway
Santa Fe Springs, CA 90670

1401506
RECEIVED

**SUBJECT: SOIL VAPOR & UPWARD VAPOR MIGRATION REPORT –
Thrifty #116, 1551 Rosecrans, San Diego, CA**

AUG 27 2004
ENVIRONMENTAL

H&P Mobile Geochemistry Project # TH072004-L5

Mr. Higinbotham:

Please find enclosed this data report, data tables, and upward vapor migration risk assessment calculations for the soil vapor survey conducted at the above referenced location. H&P Mobile Geochemistry performed this survey on July 20, 2004 under contract to Thrifty Oil Co.

Project Objective

The subject site consisted of an active gasoline service station. The purpose of the soil vapor survey was to assess the risk to human health due to the upward migration of potentially hazardous volatile compounds through the vadose zone as required by DEH in a letter dated June 8, 2004. The active soil vapor method was used for this assessment since the technique offers the best technical approach for determining this potential risk pathway.

Project Summary

Soil vapor samples were collected by H&P personnel and analyzed on-site in H&P's state certified mobile laboratory. Sample collection and analysis followed the guidelines described in the San Diego County SA/M manual, with the addition of a tracer/leak gas to ensure air was not introduced by leaks in the sampling system or breakthrough from the surface. Samples were collected at 2-foot depths at five locations, SV1-SV5, on the site suggested by DEH personnel (Figure 1), including one duplicate. The sampling locations were chosen to give a reasonable representation of the soil vapor under the footprint of the building, with the goal of providing an average estimate of the upward vapor migration risk into the existing building.

Soil vapor samples were analyzed by H&P for the four single-ring aromatic hydrocarbons (BTEX) by EPA method 8260, with special emphasis on benzene, since the acceptable levels for this compound are several orders of magnitude lower than the other single-ring aromatic hydrocarbons.

Results

The results for all of the samples are summarized in the enclosed laboratory report and chain-of-custody documentation. Values are in units of ug/l-vapor. The detected values were at or below 0.2 ug/L at all five sampling locations at the 2-foot depths.

432 North Cedros Avenue, Solana Beach, California 92075 | 858 793.0401 — Fax 858 793.0404
148 South Vinewood Street, Escondido, California 92029 | 760 735.3208 — Fax 760 735.2469
2373 208th Street, Suite F-1, Torrance, California 90501 | 310 782.2929 — Fax 310 782.2798

Calculation of the upward migration risk was performed using the worst-case scenario (i.e., using the highest reported benzene value of 0.2 ug/L). The calculated risk using these worst-case values is 9.4 e-9 for a commercial setting and 1.1 e-7 for a residential setting. Both scenarios pass acceptable levels by approximately 200 and 10 times, respectively. The calculations for both scenarios are summarized in the attached pages.

Risk calculations were not performed for the other aromatic compounds since all measurements were below detection levels and acceptable risk levels are much higher than benzene.

Summary & Recommendations

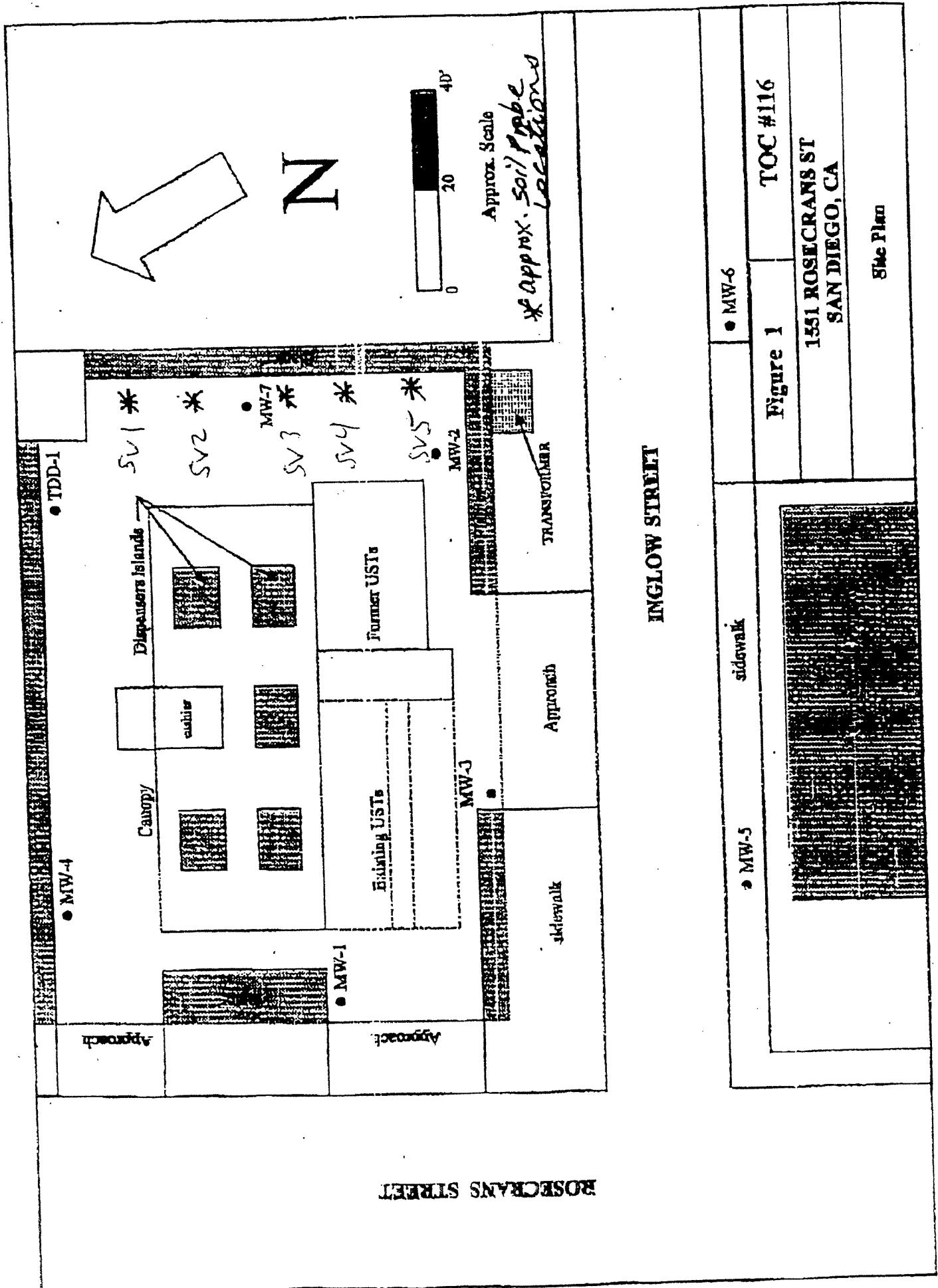
The data collected in this survey do not show any evidence of significant levels of subsurface contamination by the single ring aromatic hydrocarbons (BTEX). Upward vapor migration risk calculations pass acceptable levels by factors of approximately 10 to 200 times for residential and commercial scenarios, respectively, based upon using the highest detected levels. Hence, there does not appear to be any threat to human health by this risk pathway.

H&P Mobile Geochemistry appreciates the opportunity to provide soil vapor services on this project. If you have any questions relating to this data or report, please do not hesitate to contact us.

Sincerely,



Dr. Blayne Hartman



Case Name:
Military #176, San Diego, CA

Commercial

CHEMICAL OF CONCERN:

Enter Chemical Name = benzene

C11 benzene	E11 dichloromethane (methylene chloride)
C12 benzo(a)pyrene	E12 ethylbenzene
C13 carbon tetrachloride	E13 naphthalene
C14 chlorobenzene	E14 methyl tertiary butyl ether (MTBE)
C15 chloroethane (ethyl chloride)	E15 tetrachloroethene (PCE)
C16 chloromethane (methyl chloride)	E16 toluene
C17 1,2-dichlorobenzene	E17 1,1,1-trichloroethane
C18 1,3-dichlorobenzene	E18 1,1,2-trichloroethane
C19 1,4-dichlorobenzene	E19 trichloroethene (TCE)
C20 1,1-dichloroethene (1,1-DCE)	E20 trichloromethane (chloroform)
C21 trans-1,2-dichloroethene	E21 vinyl chloride
C22 1,1-dichloroethane (1,1-DCA)	E22 xylene
C23 1,2-dichloroethane (1,2-DCA)	

Chemical Mixture (if app.) =

C27 Gasoline	E27 Fuel Oil
C28 Kerosene	E28 Waste Oil
C29 Diesel	

If compound is not listed then data must be entered into the site-specific field.

SITE SPECIFIC INFORMATION		Site-Specific	Value Used
Mole fraction	dimensionless	MF	0.0000
Temperature	K	T	293
Water concentration (chemical)	ug/l	C _w	
Soil concentration (chemical)	mg/kg	C _s	0
Soil concentration (TPH/TRPH)	mg/kg	C _t	0
Soil gas concentration (measured mg/m ³ (ug/l))	C _{sg(m)}	0.2	0.2
Depth of contamination or Soil C m	X	0.61	0.61

CHEMICAL PROPERTIES			
Henry's Law Constant	dimensionless	H	0.23
Vapor pressure	atm	VP	0.13
Molecular weight (chemical)	mg/mole	MW	78.110
Molecular weight (mixture)	mg/mole	MW(m)	#N/A
Universal gas constant	atm-m ³ /mole-K R	XXXXXXXXXXXX	8.20E-05
Diffusion coefficient in air	cm ² /sec	D _a	0.088
Organic carbon partitioning coeff. cm ³ /gm	K _{oc}		62
SOIL PROPERTIES			
Total porosity	dimensionless	θ	0.3
Air-filled porosity	dimensionless	θ _a	0.2
Water-filled porosity	dimensionless	θ _w	0.1
Bulk density (dry)	gr/cc	ρ _b	1.8
Weight fraction of organic carbon dimensionless	foc		0.01
BUILDING SPECIFICATIONS			
Floor area of building	m ²	A	1
% of floor area that flux occurs	dimensionless		100%
Interior Height of building	m	R _h	2.44
Exchange rate of air	exchanges/hr	E	0.83
Attenuation factor(Crack factor)	dimensionless	S _b	0.01
OUTDOOR AIR COMPONENT			
Downwind contamination length	m	L	0
Wind speed	mv/hr	u	16000
Height of building openings	m	h	2
EXPOSURE SCENARIO Default values are for Industrial Uses			
Body weight	kg	BW	70
Inhalation rate	m ³ /day	IR	20
Exposure duration	yrs	ED	25
Hours per day	hr/day		12
Days per week	days/week		5
Weeks per year	weeks/yr		50
HEALTH RISK FACTORS			
Reference dose	mg/kg-day	RfD	0.0017
Slope factor (potency)	1/(mg/kg-day)	SF	0.1

Case Name:
Trinity #10, San Diego, CA

Commercial

CHEMICAL OF CONCERN:

Enter Chemical Name = **Benzene**

C11 benzene	E11 dichloromethane (methylene chloride)
C12 benzo(a)pyrene	E12 ethylbenzene
C13 carbon tetrachloride	E13 naphthalene
C14 chlorobenzene	E14 methyl tertiary butyl ether (MTBE)
C15 chloroethane (ethyl chloride)	E15 tetrachloroethene (PCE)
C16 chloromethane (methyl chloride)	E16 toluene
C17 1,2-dichlorobenzene	E17 1,1,1-trichloroethane
C18 1,3-dichlorobenzene	E18 1,1,2-trichloroethane
C19 1,4-dichlorobenzene	E19 trichloroethene (TCE)
C20 1,1-dichloroethene (1,1-DCE)	E20 trichloromethane (chloroform)
C21 trans-1,2-dichloroethene	E21 vinyl chloride
C22 1,1-dichloroethane (1,1-DCA)	E22 xylene
C23 1,2-dichloroethane (1,2-DCA)	

Chemical Mixture (if app.) = **[REDACTED]**

C27 Gasoline	E27 Fuel Oil
C28 Kerosene	E28 Waste Oil
C29 Diesel	

If compound is not listed then data must be entered into the site-specific field.

SITE SPECIFIC INFORMATION	Site-Specific	Value Used
Mole fraction	dimensionless MF	0.0000
Temperature	K T	293
Water concentration (chemical)	ug/l C _w	
Soil concentration (chemical)	mg/kg C _s	0
Soil concentration (TPH/TRPH)	mg/kg C _t	0
Soil gas concentration (measured mg/m3 (ug/l))	C _{sg(m)}	0.2
Depth of contamination or Soil C m	X	0.61

CHEMICAL PROPERTIES		
Henry's Law Constant	dimensionless H	0.23
Vapor pressure	atm VP	0.13
Molecular weight (chemical)	mg/mole MW	78.110
Molecular weight (mixture)	mg/mole MW(m)	#N/A
Universal gas constant	atm-m3/mole-K R	XXXXXXXXXXXX 8.20E-05
Diffusion coefficient in air	cm ² /sec D _a	0.088
Organic carbon partitioning coeff. cm ³ /gm K _{oc}		62
SOIL PROPERTIES		
Total porosity	dimensionless θ	0.3
Air-filled porosity	dimensionless θ _a	0.2
Water-filled porosity	dimensionless θ _w	XXXXXXXXXXXX 0.1
Bulk density (dry)	gm/cc r _b	1.8
Weight fraction of organic carbon dimensionless foc		0.01
BUILDING SPECIFICATIONS		
Floor area of building	m ² A	1
% of floor area that flux occurs	dimensionless	100%
Interior Height of building	m R _h	2.44
Exchange rate of air	exchanges/hr E	0.83
Attenuation factor(Crack factor)	dimensionless S _b	0.01
OUTDOOR AIR COMPONENT		
Downwind contamination length	m L	0
Wind speed	m/hr u	16000
Height of building openings	m h	2
EXPOSURE SCENARIO Default values are for Industrial Uses		
Body weight	kg BW	70
Inhalation rate	m ³ /day IR	20
Exposure duration	yrs ED	25
Hours per day	hr/day	12
Days per week	days/week	5
Weeks per year	weeks/yr	50
HEALTH RISK FACTORS		
Reference dose	mg/kg-day RD	0.0017
Slope factor (potency)	1/(mg/kg-day) SF	0.1

Case Name: Thrifty #116, San Diego, CA

Chemical: benzene

COMMERCIAL

Variable Descriptions

Units

CALCULATION OF SOIL GAS CONCENTRATION

A. SOURCE - Free Product/Soil>100mg/kg.

Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	7.81E+04	mg/mole
Vapor pressure	VP	=	1.30E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	C _{sg} (fp)	=	0.00E+00	mg/m3

B. SOURCE - Groundwater

Water contamination level	C _w	=		ug/l
Henry's Law Constant	H	=	2.30E-01	dimensionless
Calculated soil gas concentration	C _{sg} (gw)	=	0.00E+00	mg/m3

C. SOURCE - Soil < 100 mg/kg

Soil contamination level	C _t	=	0.00E+00	mg/kg
Henry's Law Constant	H	=	2.30E-01	dimensionless
Bulk density (dry)	P _b	=	1.80E+00	gm/cc
Air-filled porosity	θ _a	=	2.00E-01	dimensionless
Water-filled porosity	θ _w	=	1.00E-01	dimensionless
Soil/water distribution coeff.	K _d	=	6.20E-01	cm ³ /gm
Calculated soil gas concentration	C _{sg} (s)	=	0.00E+00	mg/m3

D. SOURCE - Measured Soil Gas

Measured soil gas concentration	C _{sg} (m)	=	2.00E-01	mg/m3 (ug/l)
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E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>> 2.00E-01 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE

Total porosity	θ	=	3.00E-01	dimensionless
Air-filled porosity	θ _a	=	2.00E-01	dimensionless
Diffusion coefficient in air	D _a	=	8.80E-02	cm ² /sec
Effective diffusion coefficient	D _e	=	4.60E-03	cm ² /sec
Depth of contamination or C _{sg}	X	=	6.10E-01	m
Calculated Flux	F _x	=	5.43E-04	mg/m ² -hour

SITE ASSESSMENT & MITIGATION VAPOR RISK ASSESSMENT MODEL

Risk Calculations

Case Name: Thrifty #116, San Diego, CA

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	1.00E+00	m ²
% of floor area that flux occurs		=	1.00E+00	dimensionless
Attenuation factor(Crack factor)	S _a	=	1.00E-02	dimensionless
Flux area within building	A _f	=	1.00E-02	m ²
Interior Height of building	R _i	=	2.44E+00	m
Volume of building	V	=	2.44E+00	m ³
Exchange rate of air	E	=	8.30E-01	exchanges/hr
Ventilation rate	Q	=	2.03E+00	m ³ /hr
Indoor air component	C _i	=	2.68E-06	mg/m ³

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=	0.00E+00	m
Wind speed	u	=	1.60E+04	m/hr
Height of building openings (or height of breathing zone)	h	=	2.00E+00	m
Outdoor air component	C _o	=	0.00E+00	mg/m ³
C. TOTAL INDOOR AIR CONCENTRATION	C _t	=	2.68E-06	mg/m ³

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m ³ /day
Exposure duration	ED	=	2.50E+01	yrs
Hours per day	conversion	=	1.20E+01	hr/day
Exposure time	ET	=	5.00E-01	hr/24 hours
Days per week	conversion	=	5.00E+00	days/week
Weeks per year	conversion	=	5.00E+01	weeks/yr
Exposure frequency	EF	=	2.50E+02	days/yr
Averaging Time (carc. risk)	AT	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT	=	9.13E+03	days
Chemical Intake (carc. risk)	IT _c	=	9.37E-08	mg/kg-day
Chemical Intake (non-carc. risk)	IT _{nc}	=	2.62E-07	mg/kg-day

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	IT _{nc}	=	2.62E-07	mg/kg-day
Reference dose	RfD	=	1.70E-03	mg/kg-day
Hazard Index	HI	=	1.54E-04	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT _c	=	9.37E-08	mg/kg-day
Slope factor (potency)	SF	=	1.00E-01	1/(mg/kg-day)
Cancer Risk	Risk	=	9.37E-09	

Case Name:
10001-#16, San Diego, CA

RESIDENTIAL

CHEMICAL OF CONCERN:

Enter Chemical Name = benzene

C11 benzene	E11 dichloromethane (methylene chloride)
C12 benzo(a)pyrene	E12 ethylbenzene
C13 carbon tetrachloride	E13 naphthalene
C14 chlorobenzene	E14 methyl tertiary butyl ether (MTBE)
C15 chloroethane (ethyl chloride)	E15 tetrachloroethene (PCE)
C16 chloromethane (methyl chloride)	E16 toluene
C17 1,2-dichlorobenzene	E17 1,1,1-trichloroethane
C18 1,3-dichlorobenzene	E18 1,1,2-trichloroethane
C19 1,4-dichlorobenzene	E19 trichloroethylene (TCE)
C20 1,1-dichloroethene (1,1-DCE)	E20 trichloromethane (chloroform)
C21 trans-1,2-dichloroethene	E21 vinyl chloride
C22 1,1-dichloroethane (1,1-DCA)	E22 xylene
C23 1,2-dichloroethane (1,2-DCA)	

Chemical Mixture (if app.) = [REDACTED]

C27 Gasoline	E27 Fuel Oil
C28 Kerosene	E28 Waste Oil
C29 Diesel	

If compound is not listed then data must be entered into the site-specific field.

SITE SPECIFIC INFORMATION	Site-Specific	Value Used
Mole fraction	dimensionless MF	0.0000
Temperature	K T	293
Water concentration (chemical)	ug/l C _w	
Soil concentration (chemical)	mg/kg C _s	0
Soil concentration (TPH/TRPH)	mg/kg C _t	0
Soil gas concentration (measured mg/m3 (ug/l))	C _{sg} (m)	0.2
Depth of contamination or Soil C m	X	0.61

CHEMICAL PROPERTIES			Site Specific	Value Used
Henry's Law Constant	dimensionless H			0.23
Vapor pressure	atm VP			0.13
Molecular weight (chemical)	mg/mole MW			78.110
Molecular weight (mixture)	mg/mole MW(m)			#N/A
Universal gas constant	atm-m3/mole-K R	XXXXXXXXXXXX		8.20E-05
Diffusion coefficient in air	cm ² /sec D _a			0.088
Organic carbon partitioning coeff. cm ³ /gm K _{oc}				62
SOIL PROPERTIES				
Total porosity	dimensionless θ		0.3	0.3
Air-filled porosity	dimensionless θ _a		0.2	0.2
Water-filled porosity	dimensionless θ _w	XXXXXXXXXXXX		0.1
Bulk density (dry)	gm/cc ρ _b			1.8
Weight fraction of organic carbon dimensionless foc				0.01
BUILDING SPECIFICATIONS				
Floor area of building	m ² A			1
% of floor area that flux occurs	dimensionless			100%
Interior Height of building	m R _b			2.44
Exchange rate of air	exchanges/hr E		0.25	0.25
Attenuation factor(Crack factor)	dimensionless S _b		0.01	0.01
OUTDOOR AIR COMPONENT				
Downwind contamination length	m L			0
Wind speed	m/hr u			16000
Height of building openings	m h			2
EXPOSURE SCENARIO Default values are for Industrial Uses				
Body weight	kg BW			70
Inhalation rate	m ³ /day IR			20
Exposure duration	hrs yrs ED		30	30
Hours per day	hr/day		24	24
Days per week	days/week		7	7
Weeks per year	weeks/yr		52	52
HEALTH RISK FACTORS				
Reference dose	mg/kg-day RD			0.0017
Slope factor (potency)	1/(mg/kg-day) SF			0.1

Case Name: Thrify #116, San Diego, CA

Chemical: benzene

Variable Descriptions

RESIDENTIAL
UnitsCALCULATION OF SOIL GAS CONCENTRATION

A. SOURCE - Free Product/Solid>100mg/kg.

Mole fraction	MF	=	0.00E+00	dimensionless
Molecular weight	MW	=	7.81E+04	mg/mole
Vapor pressure	VP	=	1.30E-01	atm
Universal gas constant	R	=	8.20E-05	atm-m3/mole-K
Temperature	T	=	2.93E+02	K
Calculated soil gas concentration	$C_{sg}(lp)$	=	0.00E+00	mg/m3

B. SOURCE - Groundwater

Water contamination level	C_w	=		ug/l
Henry's Law Constant	H	=	2.30E-01	dimensionless
Calculated soil gas concentration	$C_{sg}(gw)$	=	0.00E+00	mg/m3

C. SOURCE - Soil < 100 mg/kg

Soil contamination level	C_t	=	0.00E+00	mg/kg
Henry's Law Constant	H	=	2.30E-01	dimensionless
Bulk density (dry)	ρ_b	=	1.80E+00	gm/cc
Air-filled porosity	θ_a	=	2.00E-01	dimensionless
Water-filled porosity	θ_w	=	1.00E-01	dimensionless
Soil/water distribution coef.	K_d	=	6.20E-01	cm3/grm
Calculated soil gas concentration	$C_{sg}(s)$	=	0.00E+00	mg/m3

D. SOURCE - Measured Soil Gas

Measured soil gas concentration	$C_{sg}(m)$	=	2.00E-01	mg/m3 (ug/l)
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E. SOIL GAS CONCENTRATION USED IN RISK CALCULATIONS >>> 2.00E-01 mg/m3

DIFFUSIVE TRANSPORT UPWARD IN UNSATURATED ZONE

Total porosity	θ	=	3.00E-01	dimensionless
Air-filled porosity	θ_a	=	2.00E-01	dimensionless
Diffusion coefficient in air	D_a	=	8.80E-02	cm2/sec
Effective diffusion coefficient	D_e	=	4.60E-03	cm2/sec
Depth of contamination or Csg	X	=	6.10E-01	m
Calculated Flux	F_x	=	5.43E-04	mg/m2-hour

SITE ASSESSMENT & MITIGATION VAPOR RISK ASSESSMENT MODEL

Page 2-2

Risk Calculations

Version: November 1996

Case Name: Thrify #116, San Diego, CA

CALCULATING VAPOR CONCENTRATION IN BUILDING

A. INDOOR AIR COMPONENT

Floor area of building	A	=	1.00E+00	m2
% of floor area that flux occurs		=	1.00E+00	dimensionless
Attenuation factor(Crack factor)	S _a	=	1.00E-02	dimensionless
Flux area within building	A _f	=	1.00E-02	m2
Interior Height of building	R _i	=	2.44E+00	m
Volume of building	V	=	2.44E+00	m3
Exchange rate of air	E	=	2.50E-01	exchanges/hr
Ventilation rate	Q	=	6.10E-01	m3/hr
Indoor air component	C _i	=	8.90E-06	mg/m3

B. OUTDOOR AIR COMPONENT

Downwind contamination length	L	=	0.00E+00	m
Wind speed	u	=	1.60E+04	m/hr
Height of building openings (or height of breathing zone)	h	=	2.00E+00	m
Outdoor air component	C _o	=	0.00E+00	mg/m3
C. TOTAL INDOOR AIR CONCENTRATION	C _t	=	8.90E-06	mg/m3

EXPOSURE SCENARIO

Body weight	BW	=	7.00E+01	kg
Inhalation rate	IR	=	2.00E+01	m3/day
Exposure duration	ED	=	3.00E+01	hrs
Hours per day		conversion	2.40E+01	hr/day
Exposure time	ET	=	1.00E+00	hr/24 hours
Days per week		conversion	7.00E+00	days/week
Weeks per year		conversion	5.20E+01	weeks/yr
Exposure frequency	EF	=	3.84E+02	days/yr
Averaging Time (carc. risk)	AT _c	=	2.56E+04	days
Averaging Time (non-carc. risk)	AT _{nc}	=	1.10E+04	days
Chemical Intake (carc. risk)	IT _c	=	1.09E-06	mg/kg-day
Chemical Intake (non-carc. risk)	IT _{nc}	=	2.54E-06	mg/kg-day

NON-CARCINOGENIC RISK (Chronic Risk)

Chemical Intake (non-carc. risk)	IT _{nc}	=	2.54E-06	mg/kg-day
Reference dose	RfD	=	1.70E-03	mg/kg-day
Hazard Index	HI	=	1.49E-03	

CARCINOGENIC RISK

Chemical Intake (carc. risk)	IT _c	=	1.09E-06	mg/kg-day
Slope factor (potency)	SF	=	1.00E-01	1/(mg/kg-day)
Cancer Risk	Risk	=	1.09E-07	

26 July 2004

Mr. Larry Higinbotham
Thrifty Oil Co
13116 Imperial Highway
Santa Fe Springs, CA 90670

RE: TH072004-L5

Enclosed are the results of analyses for samples received by the laboratory on 20-Jul-04 . If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Tamara Davis
Laboratory Director

H&P Mobile Geochemistry operates under CA Environmental Lab Accreditation Program Numbers 1317, 1561, 1667, 1745, 1746, 1839, 2088, 2278, 2530 and 2543.

432 North Cedros Avenue, Solana Beach, California 92075 | 858 793.0401 — Fax 858 793.0404
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Thrifty Oil Co
13116 Imperial Highway
Santa Fe Springs CA, 90670

Project: TH072004-LS
Project Number: 1551 Rosecrans / Thrifty Station #116
Project Manager: Mr. Larry Higinbotham

Reported:
26-Jul-04

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SV1-2	5407005-01	Vapor	20-Jul-04	20-Jul-04
SV2-2	5407005-02	Vapor	20-Jul-04	20-Jul-04
SV3-2	5407005-03	Vapor	20-Jul-04	20-Jul-04
SV4-2	5407005-04	Vapor	20-Jul-04	20-Jul-04
SV5-2	5407005-05	Vapor	20-Jul-04	20-Jul-04
SV5-2 dupe	5407005-06	Vapor	20-Jul-04	20-Jul-04



Thrifty Oil Co
13116 Imperial Highway
Santa Fe Springs CA, 90670

Project: TH072004-L5
Project Number: 1551 Rosecrans / Thrifty Station #116
Project Manager: Mr. Larry Higinbotham

Reported:
26-Jul-04

Volatile Organic Compounds by EPA Method 8260B

H&P Mobile Geochemistry Lab L5

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
V1-2 (5407005-01) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
,1,1-Difluoroethane	ND	10	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	8260B	
V2-2 (5407005-02) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
,1,1-Difluoroethane	ND	10	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	8260B	
V3-2 (5407005-03) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
,1,1-Difluoroethane	ND	10	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	8260B	
SV4-2 (5407005-04) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
,1,1-Difluoroethane	ND	10	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	8260B	
SV5-2 (5407005-05) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
,1,1-Difluoroethane	ND	10	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	8260B	
SV5-2 dupe (5407005-06) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
,1,1-Difluoroethane	ND	10	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	8260B	

Thrifty Oil Co
 13116 Imperial Highway
 Santa Fe Springs CA, 90670

Project: TH072004-L5
 Project Number: 1551 Rosecrans / Thrifty Station #116
 Project Manager: Mr. Larry Higinbotham

Reported:
 26-Jul-04

Volatile Organic Compounds by EPA Method 8260B in Air

H&P Mobile Geochemistry Lab L5

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
V1-2 (5407005-01) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
Methyl tert-butyl ether	ND	1	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	EPA 8260B	
Benzene	0.1	0.1	"	"	"	"	"	"	"
Toluene	ND	1	"	"	"	"	"	"	"
Ethylbenzene	ND	1	"	"	"	"	"	"	"
m,p-Xylene	ND	2	"	"	"	"	"	"	"
-Xylene	ND	1	"	"	"	"	"	"	"
Surrogate: Dibromofluoromethane	98.4 %	75-125		"	"	"	"	"	"
Surrogate: 1,2-Dichloroethane-d4	102 %	75-125		"	"	"	"	"	"
Surrogate: Toluene-d8	101 %	75-125		"	"	"	"	"	"
Surrogate: 4-Bromofluorobenzene	96.0 %	75-125		"	"	"	"	"	"
SV2-2 (5407005-02) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
Methyl tert-butyl ether	ND	1	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	EPA 8260B	
Benzene	ND	0.1	"	"	"	"	"	"	"
Toluene	ND	1	"	"	"	"	"	"	"
Ethylbenzene	ND	1	"	"	"	"	"	"	"
n,p-Xylene	ND	2	"	"	"	"	"	"	"
o-Xylene	ND	1	"	"	"	"	"	"	"
Surrogate: Dibromofluoromethane	93.6 %	75-125		"	"	"	"	"	"
Surrogate: 1,2-Dichloroethane-d4	95.2 %	75-125		"	"	"	"	"	"
Surrogate: Toluene-d8	92.4 %	75-125		"	"	"	"	"	"
Surrogate: 4-Bromofluorobenzene	90.0 %	75-125		"	"	"	"	"	"
SV3-2 (5407005-03) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
Methyl tert-butyl ether	ND	1	ug/l	0.05	5G42001	20-Jul-04	22-Jul-04	EPA 8260B	
Benzene	0.2	0.1	"	"	"	"	"	"	"
Toluene	ND	1	"	"	"	"	"	"	"
Ethylbenzene	ND	1	"	"	"	"	"	"	"
m,p-Xylene	ND	2	"	"	"	"	"	"	"
o-Xylene	ND	1	"	"	"	"	"	"	"
Surrogate: Dibromofluoromethane	98.4 %	75-125		"	"	"	"	"	"
Surrogate: 1,2-Dichloroethane-d4	98.8 %	75-125		"	"	"	"	"	"
Surrogate: Toluene-d8	97.6 %	75-125		"	"	"	"	"	"
Surrogate: 4-Bromofluorobenzene	94.4 %	75-125		"	"	"	"	"	"

Thrifty Oil Co
13116 Imperial Highway
Santa Fe Springs CA, 90670

Project: TH072004-L5
Project Number: 1551 Rosecrans / Thrifty Station #116
Project Manager: Mr. Larry Higinbotham

Reported:
26-Jul-04

Volatile Organic Compounds by EPA Method 8260B in Air

H&P Mobile Geochemistry Lab L5

Analyst	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
V4-2 (5407005-04) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
Methyl tert-butyl ether	ND	1	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	EPA 8260B	"
Benzene	0.1	0.1	"	"	"	"	"	"	"
Toluene	ND	1	"	"	"	"	"	"	"
Ethylbenzene	ND	1	"	"	"	"	"	"	"
m,p-Xylene	ND	2	"	"	"	"	"	"	"
o-Xylene	ND	1	"	"	"	"	"	"	"
Surrogate: Dibromofluoromethane	95.6 %	75-125	"	"	"	"	"	"	"
Surrogate: 1,2-Dichloroethane-d4	100 %	75-125	"	"	"	"	"	"	"
Surrogate: Toluene-d8	94.0 %	75-125	"	"	"	"	"	"	"
Surrogate: 4-Bromofluorobenzene	90.0 %	75-125	"	"	"	"	"	"	"
SV5-2 (5407005-05) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
Methyl tert-butyl ether	ND	1	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	EPA 8260B	"
Benzene	0.1	0.1	"	"	"	"	"	"	"
Toluene	ND	1	"	"	"	"	"	"	"
Ethylbenzene	ND	1	"	"	"	"	"	"	"
m,p-Xylene	ND	2	"	"	"	"	"	"	"
o-Xylene	ND	1	"	"	"	"	"	"	"
Surrogate: Dibromofluoromethane	97.6 %	75-125	"	"	"	"	"	"	"
Surrogate: 1,2-Dichloroethane-d4	104 %	75-125	"	"	"	"	"	"	"
Surrogate: Toluene-d8	97.6 %	75-125	"	"	"	"	"	"	"
Surrogate: 4-Bromofluorobenzene	97.6 %	75-125	"	"	"	"	"	"	"
SV5-2 dupe (5407005-06) Vapor Sampled: 20-Jul-04 Received: 20-Jul-04									
Methyl tert-butyl ether	ND	1	ug/l	0.05	5G42001	20-Jul-04	20-Jul-04	EPA 8260B	"
Benzene	0.2	0.1	"	"	"	"	"	"	"
Toluene	ND	1	"	"	"	"	"	"	"
Ethylbenzene	ND	1	"	"	"	"	"	"	"
m,p-Xylene	ND	2	"	"	"	"	"	"	"
o-Xylene	ND	1	"	"	"	"	"	"	"
Surrogate: Dibromofluoromethane	98.0 %	75-125	"	"	"	"	"	"	"
Surrogate: 1,2-Dichloroethane-d4	99.2 %	75-125	"	"	"	"	"	"	"
Surrogate: Toluene-d8	97.6 %	75-125	"	"	"	"	"	"	"
Surrogate: 4-Bromofluorobenzene	96.8 %	75-125	"	"	"	"	"	"	"

MOBILE GEOCHEMISTRY



Thrifty Oil Co
13116 Imperial Highway
Santa Fe Springs CA, 90670

Project: TH072004-L5
Project Number: 1551 Rosecrans / Thrifty Station #116
Project Manager: Mr. Larry Higinbotham

Reported:
26-Jul-04

Volatile Organic Compounds by EPA Method 8260B - Quality Control
H&P Mobile Geochemistry Lab L5

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	---------	-----------	-------

Batch 5G42001 - EPA 5030

Blank (5G42001-BLK1)

Prepared & Analyzed: 20-Jul-04

,1-Difluoroethane ND 10 ug/l



Thrifty Oil Co
13116 Imperial Highway
Santa Fe Springs CA, 90670

Project: TH072004-L5
Project Number: 1551 Rosecrans / Thrifty Station #116
Project Manager: Mr. Larry Higinbotham

Reported:
26-Jul-04

Volatile Organic Compounds by EPA Method 8260B in Air - Quality Control
H&P Mobile Geochemistry Lab L5

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 5G42001 - EPA 5030										
Blank (5G42001-BLK1)										
Prepared & Analyzed: 20-Jul-04										
Ethyl tert-butyl ether	ND	1.0	ug/l							
Benzene	ND	0.100	"							
Toluene	ND	1.0	"							
ethylbenzene	ND	1.0	"							
m,p-Xylene	ND	2.0	"							
n-Xylene	ND	1.0	"							
Surrogate: Dibromofluoromethane	2.13	"	2.50		85.2	75-125				
Surrogate: 1,2-Dichloroethane-d4	2.22	"	2.50		88.8	75-125				
Surrogate: Toluene-d8	2.11	"	2.50		84.4	75-125				
Surrogate: 4-Bromofluorobenzene	2.39	"	2.50		95.6	75-125				



Thrifty Oil Co
13116 Imperial Highway
Santa Fe Springs CA, 90670

Project: TH072004-LS
Project Number: 1551 Rosecrans / Thrifty Station #116
Project Manager: Mr. Larry Higinbotham

Reported:
26-Jul-04

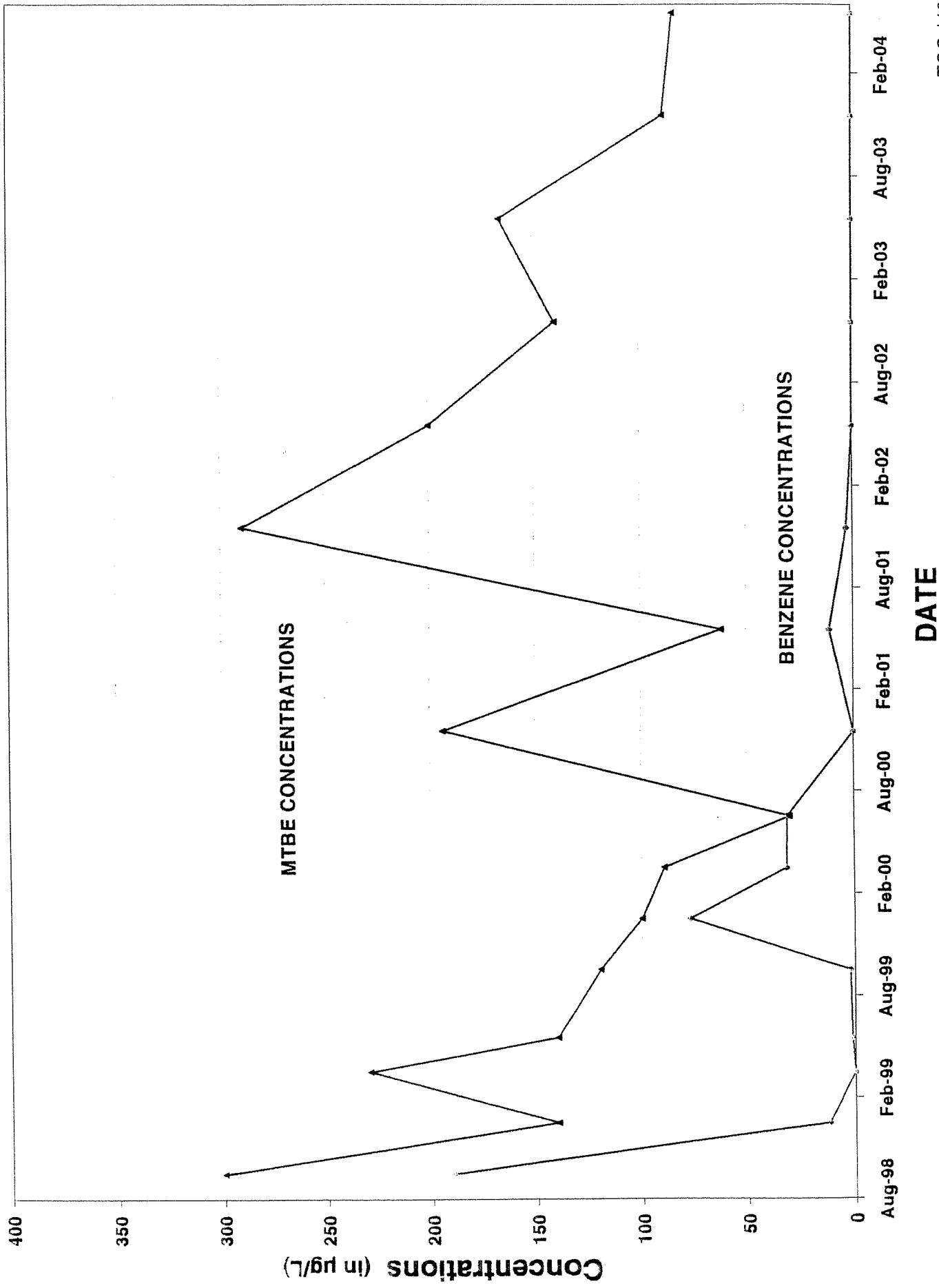
Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

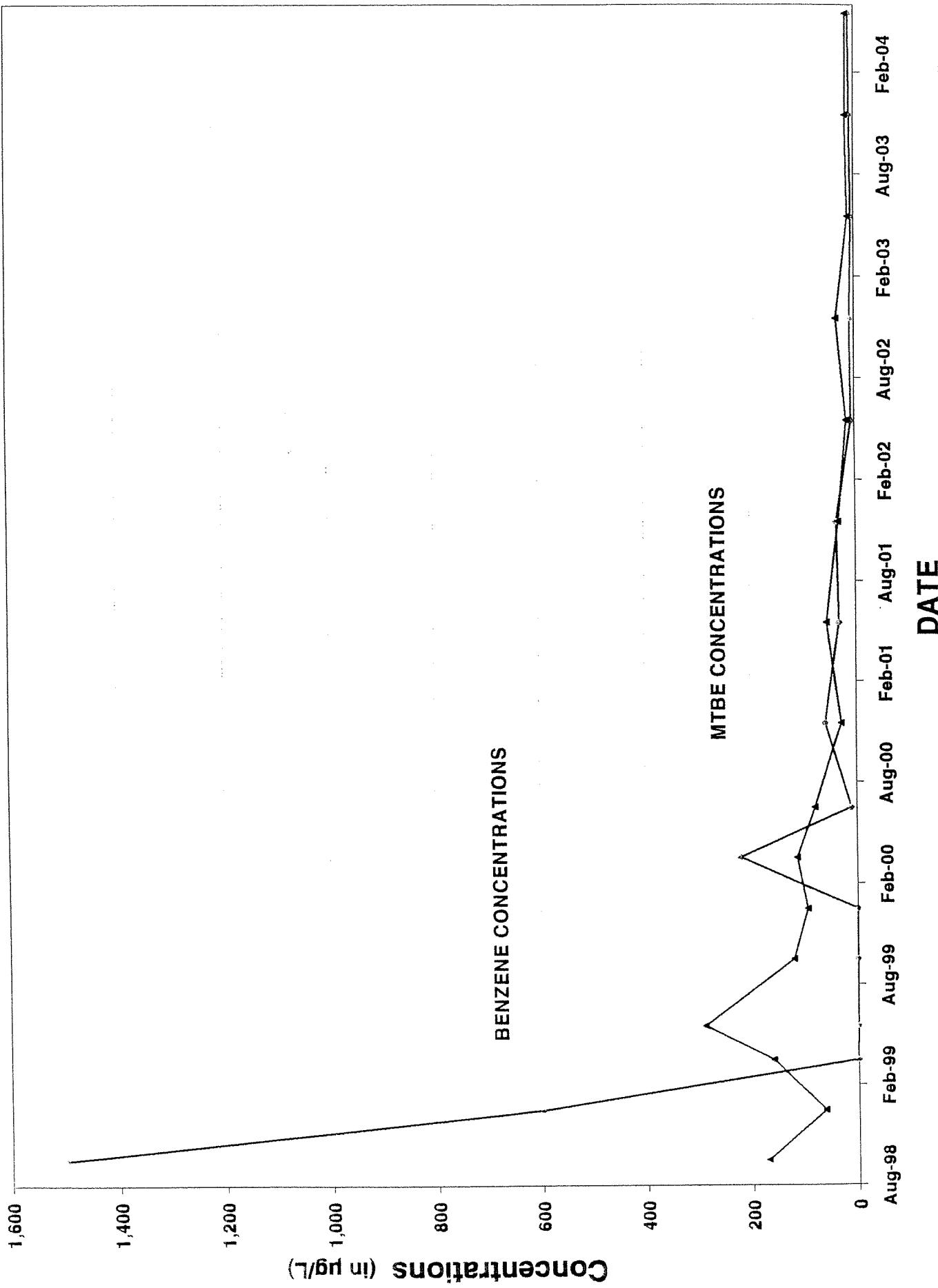
APPENDIX C

Benzene and MTBE Concentrations vs. Time

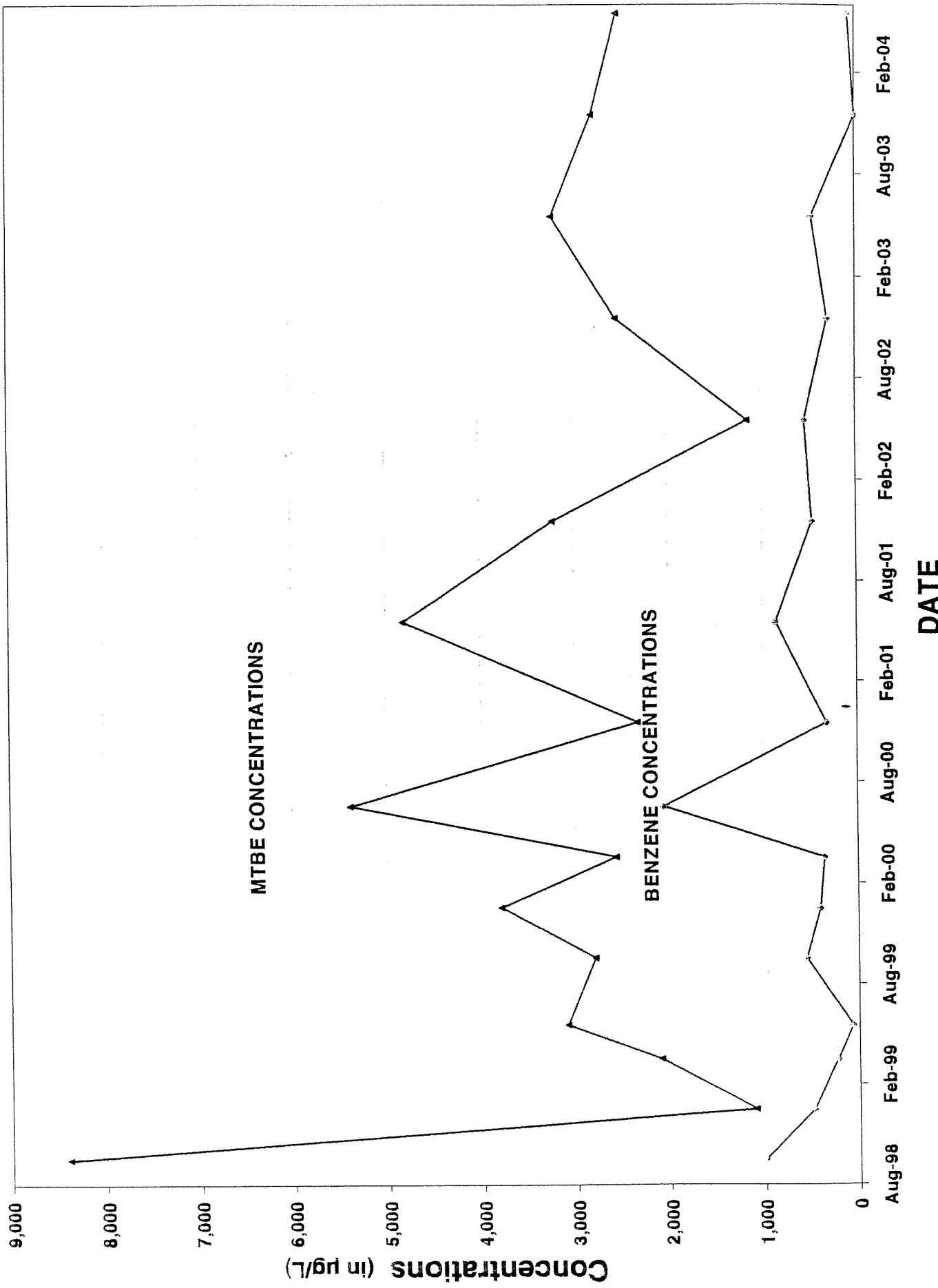
Benzene and MTBE Concentrations vs. Time TDD-1



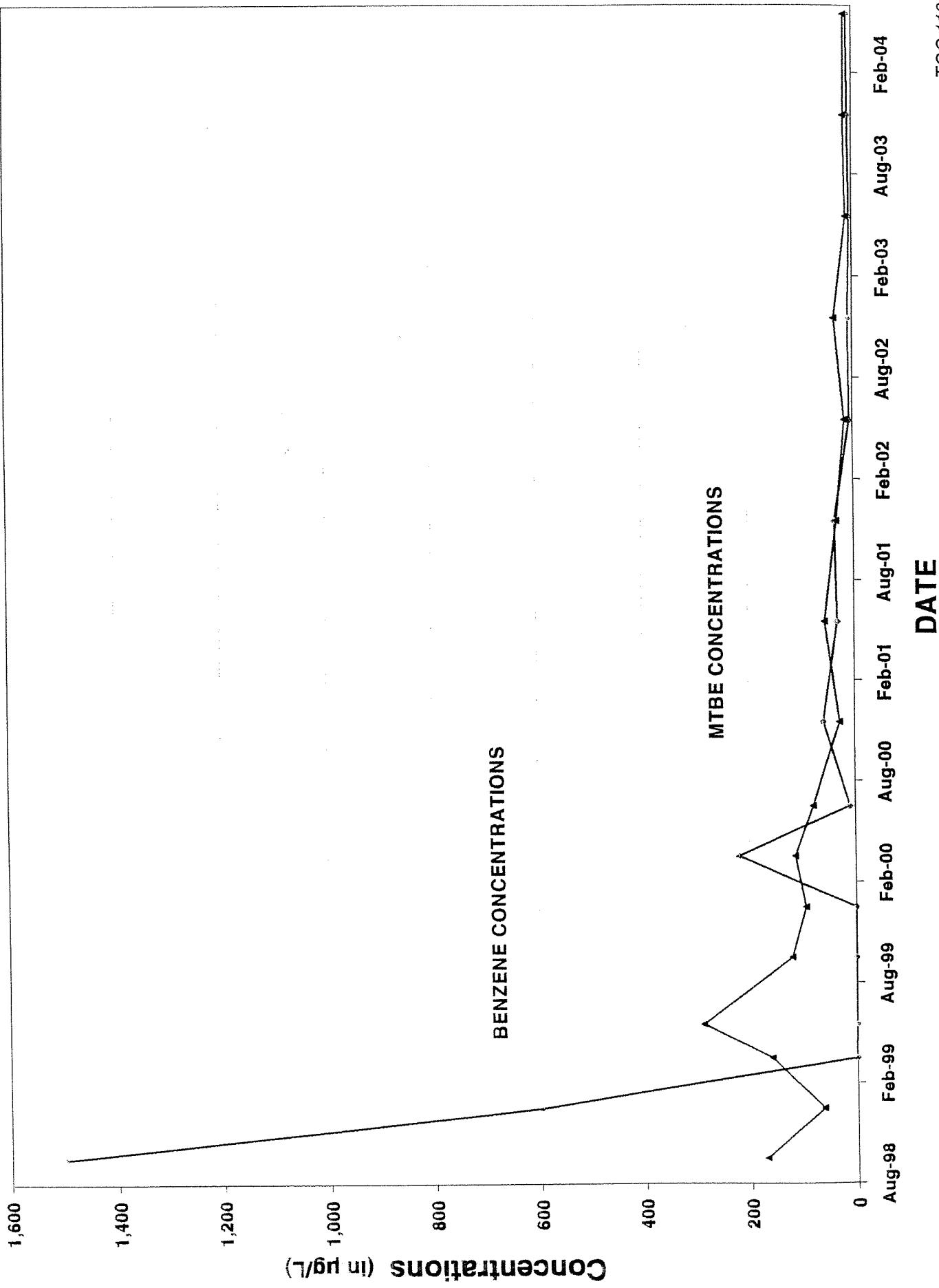
Benzene and MTBE Concentrations vs. Time MW-1



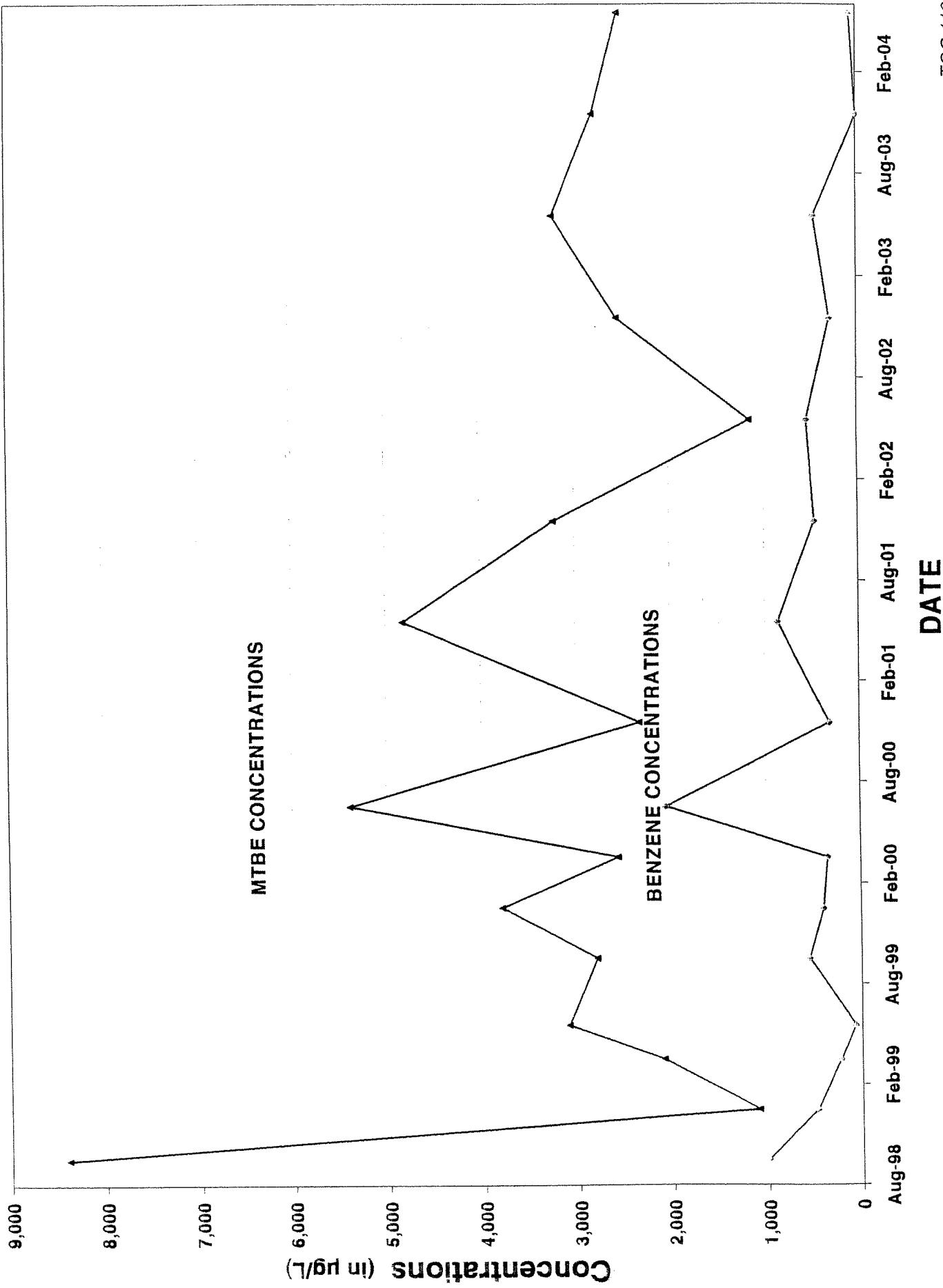
**Benzene and MTBE Concentrations
vs. Time MW-2**



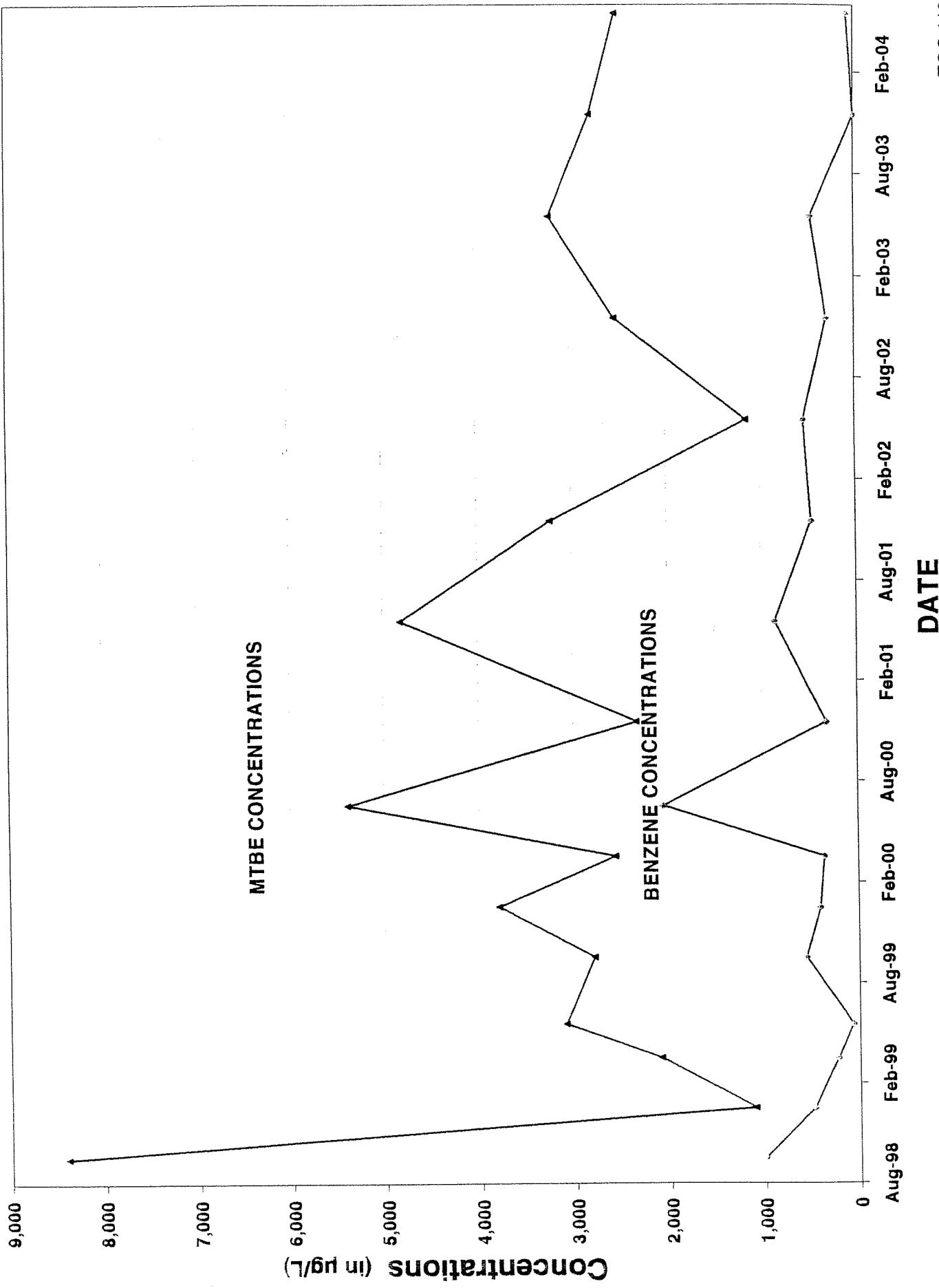
Benzene and MTBE Concentrations vs. Time MW-1



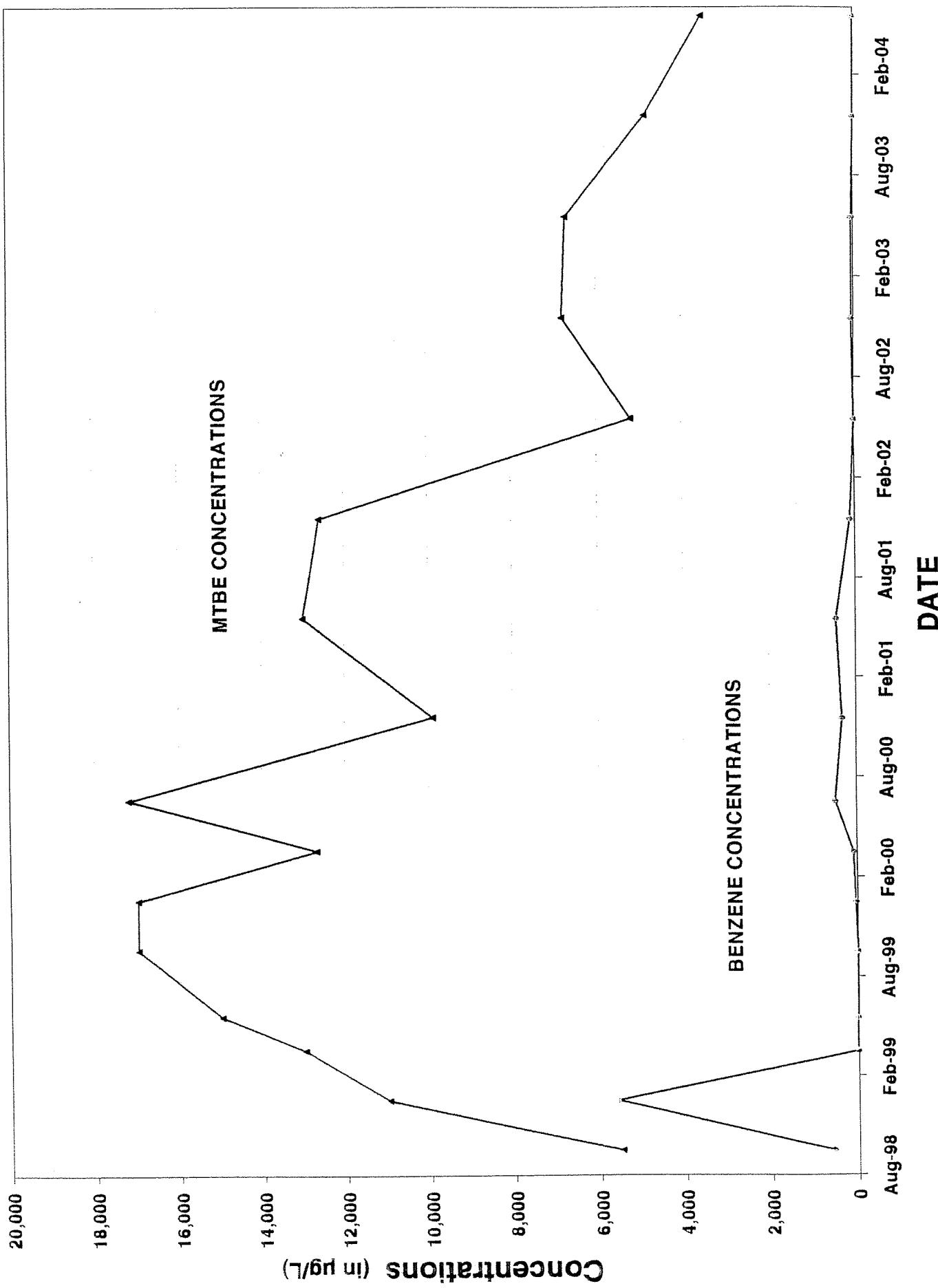
**Benzene and MTBE Concentrations
vs. Time MW-2**



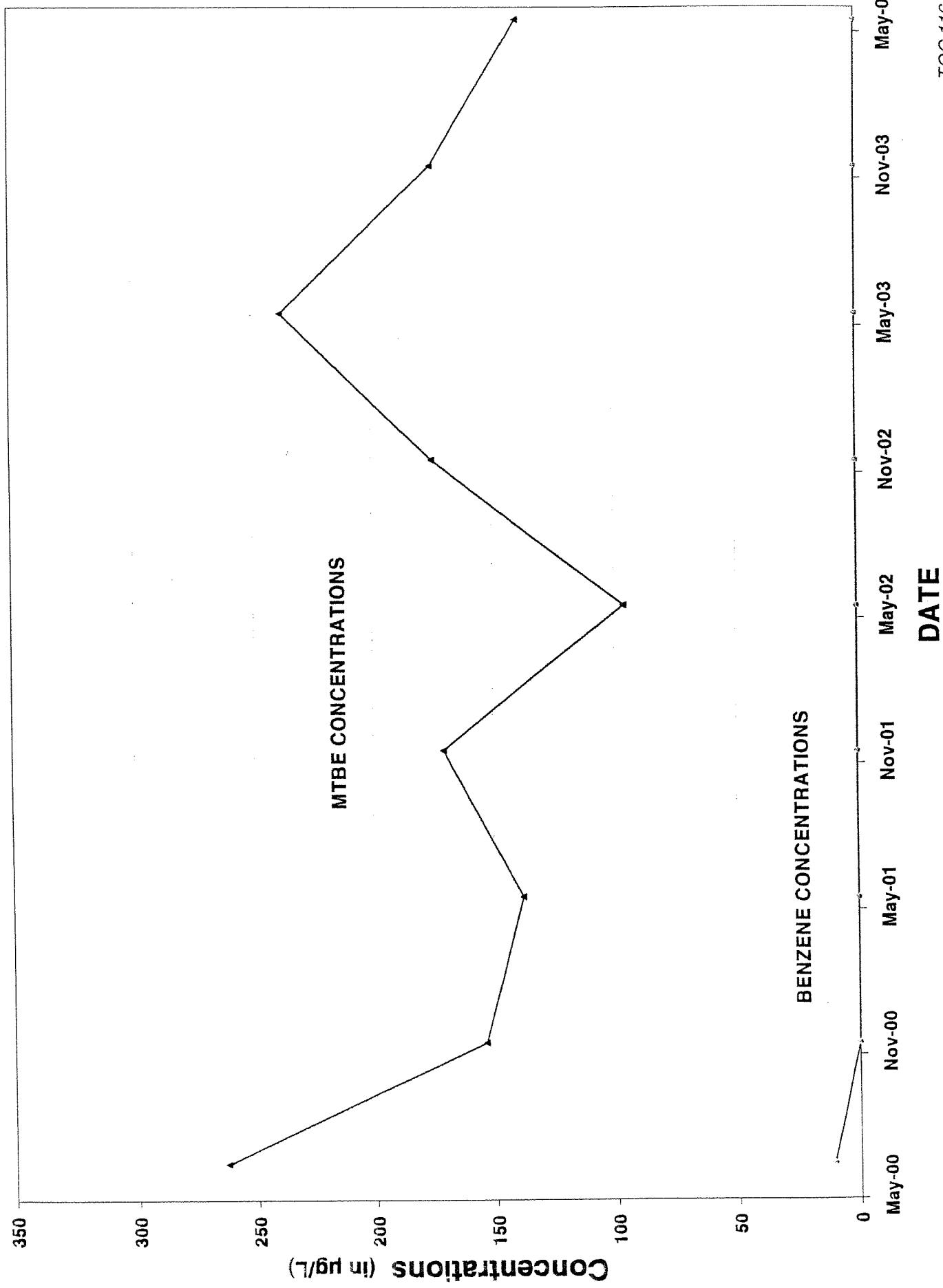
Benzene and MTBE Concentrations vs. Time MW-2



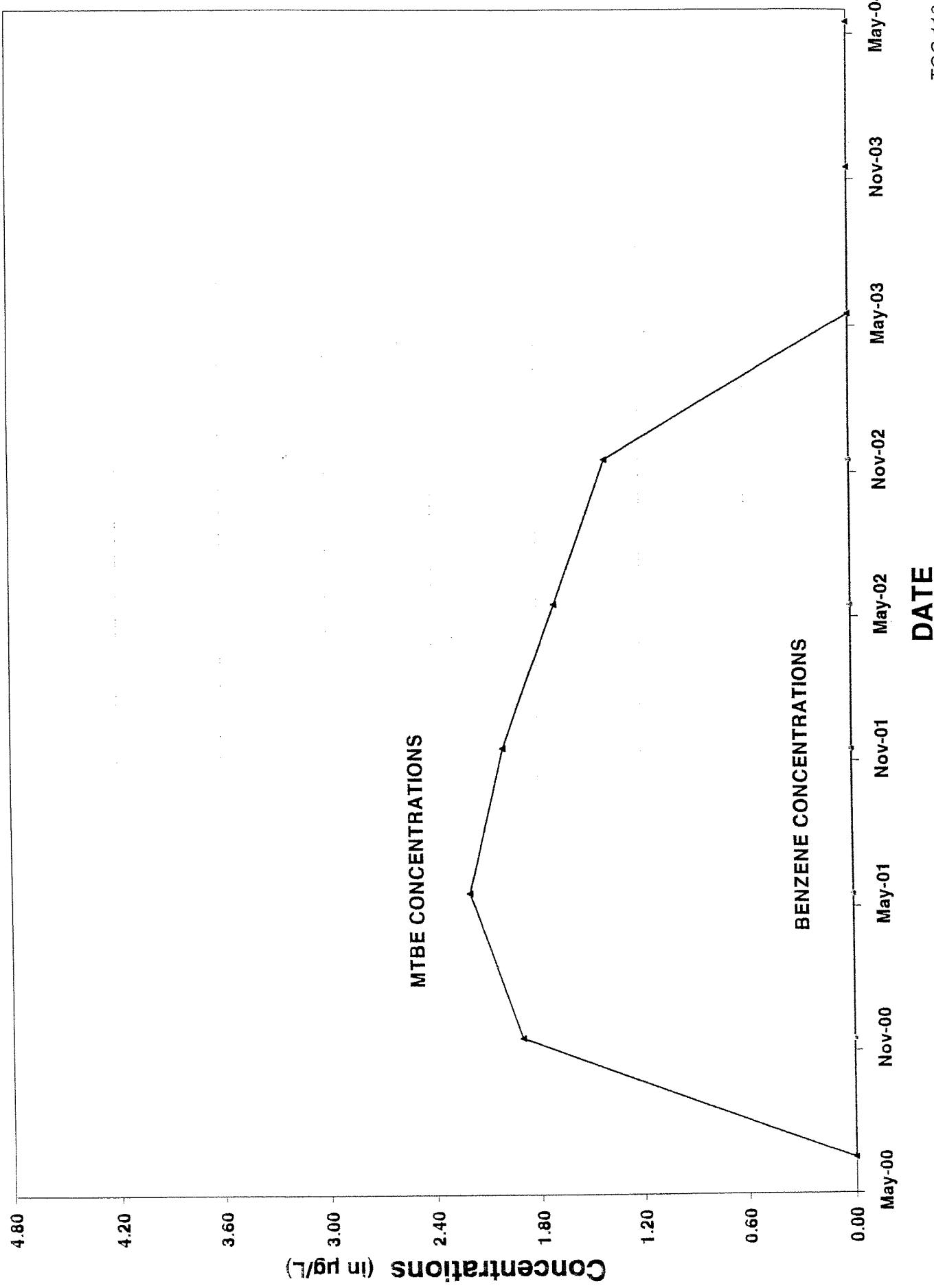
Benzene and MTBE Concentrations vs. Time MW-3



Benzene and MTBE Concentrations vs. Time MW-4

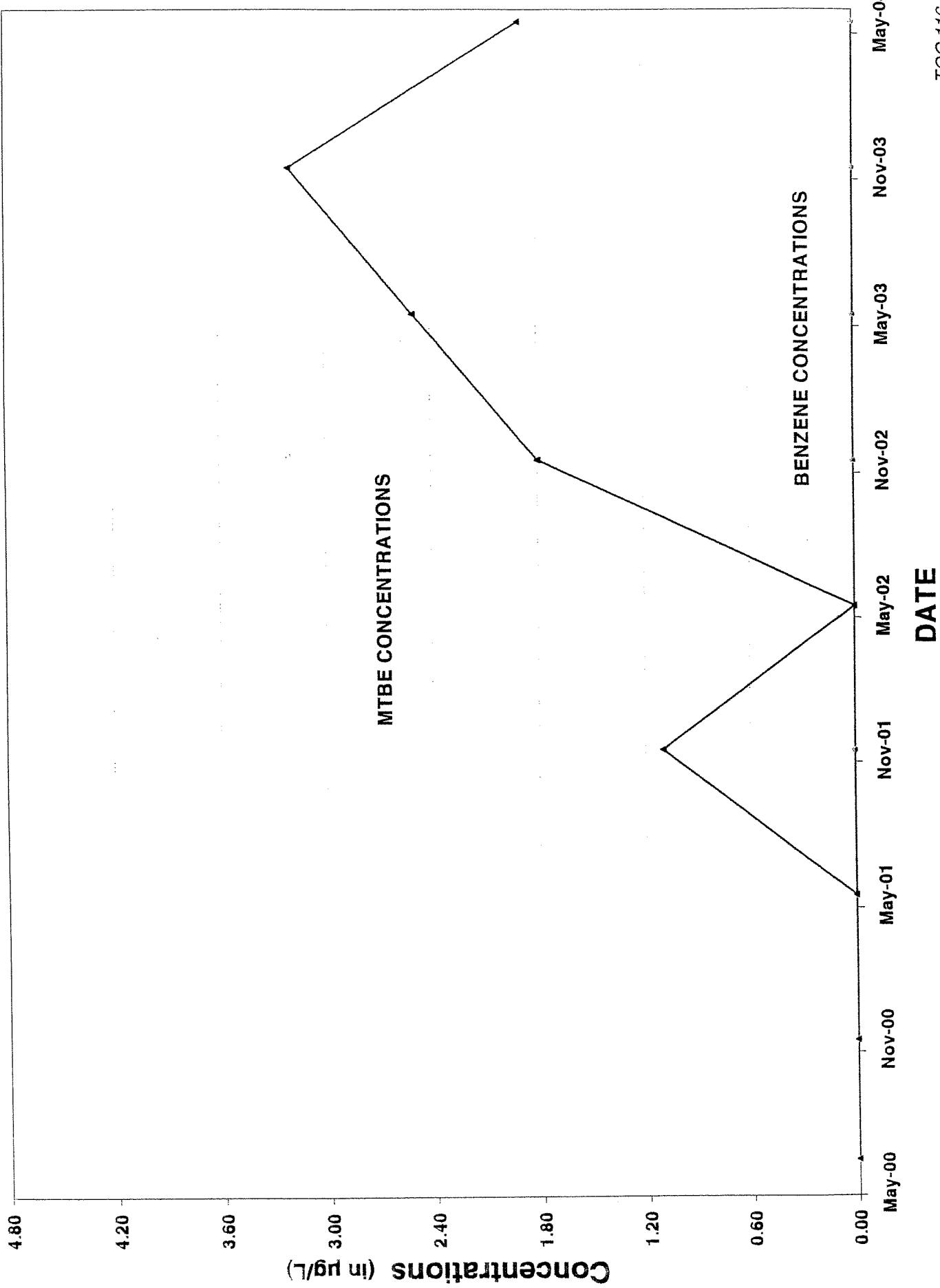


Benzene and MTBE Concentrations vs. Time MW-5

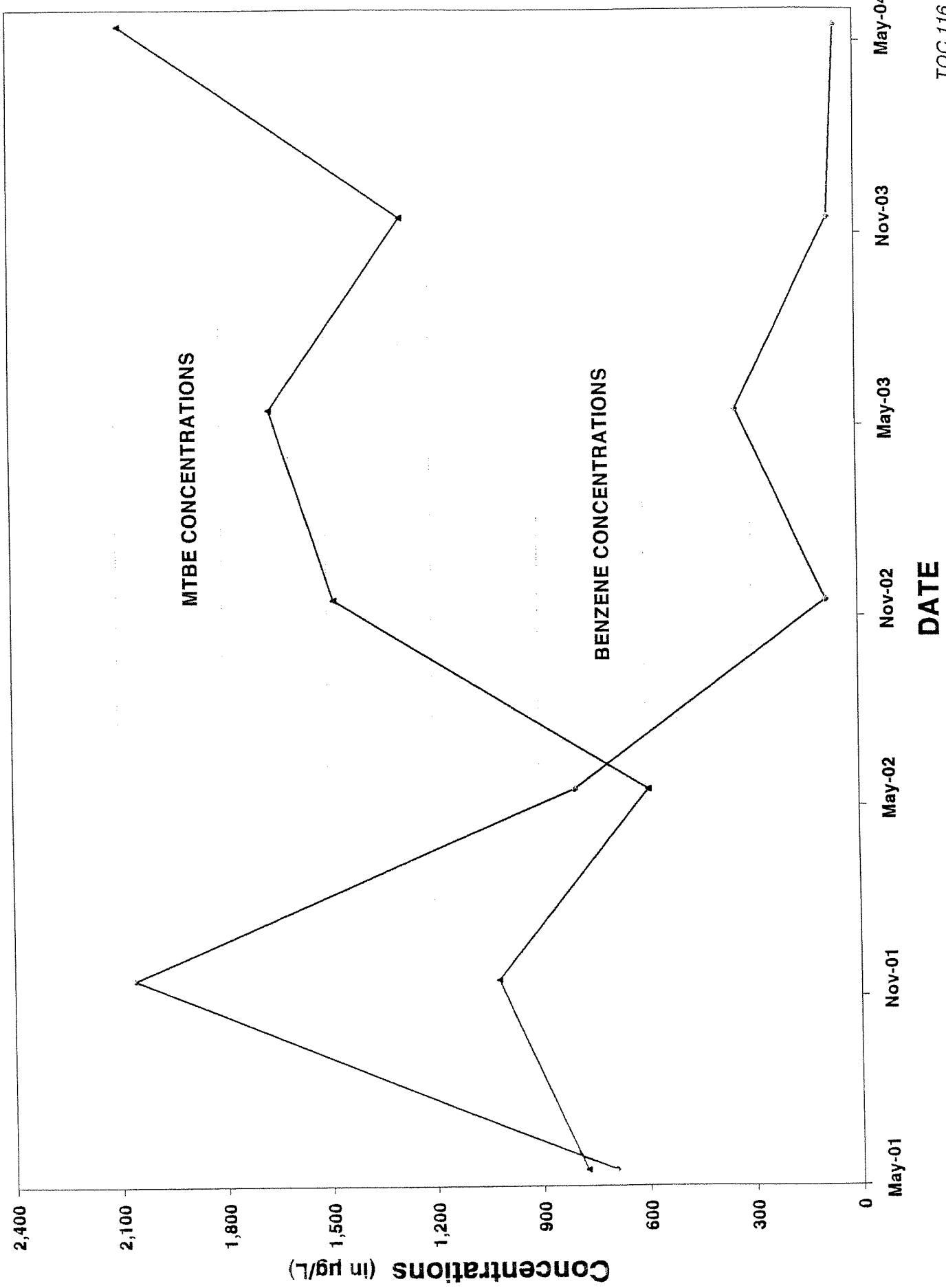


TOC 116

Benzene and MTBE Concentrations vs. Time MW-6



**Benzene and MTBE Concentrations
vs. Time MW-7**

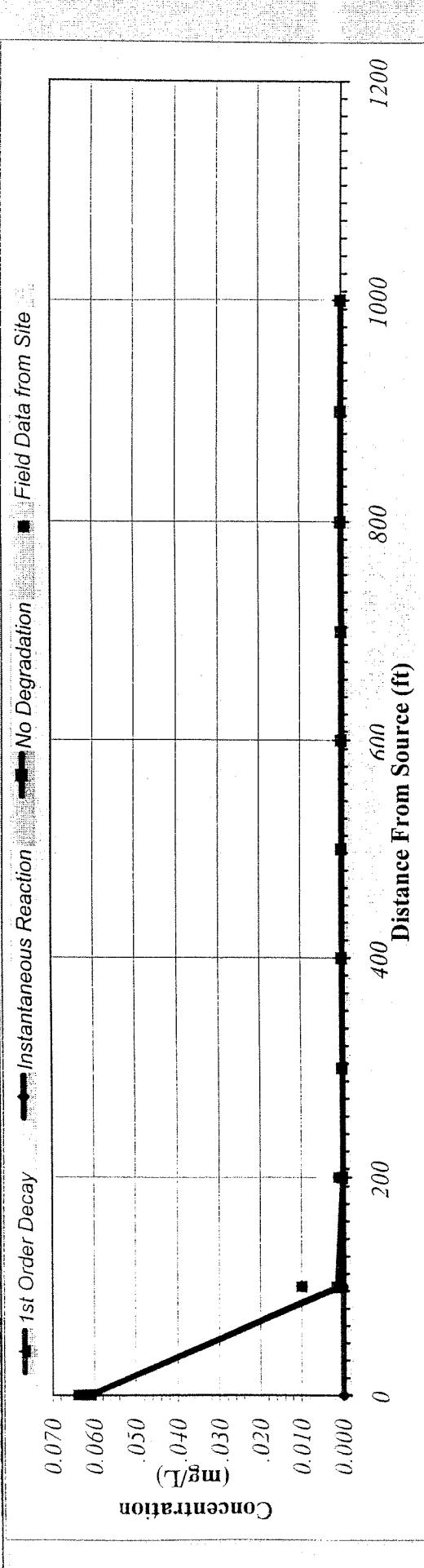


APPENDIX D

BIOSCREEN Input and Output for Benzene RNA

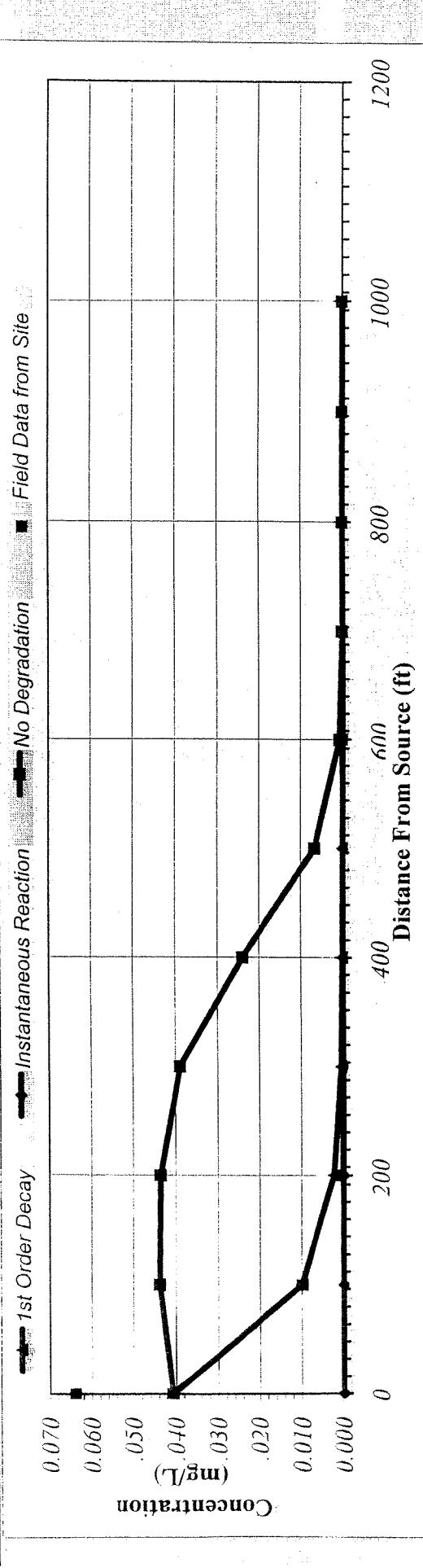
DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.061	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.061	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.064	0.010	0.001								



DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.041	0.044	0.044	0.039	0.024	0.007	0.001	0.000	0.000	0.000	0.000
1st Order Decay	0.041	0.010	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.064	0.010	0.001								



[Calculate Animation](#)

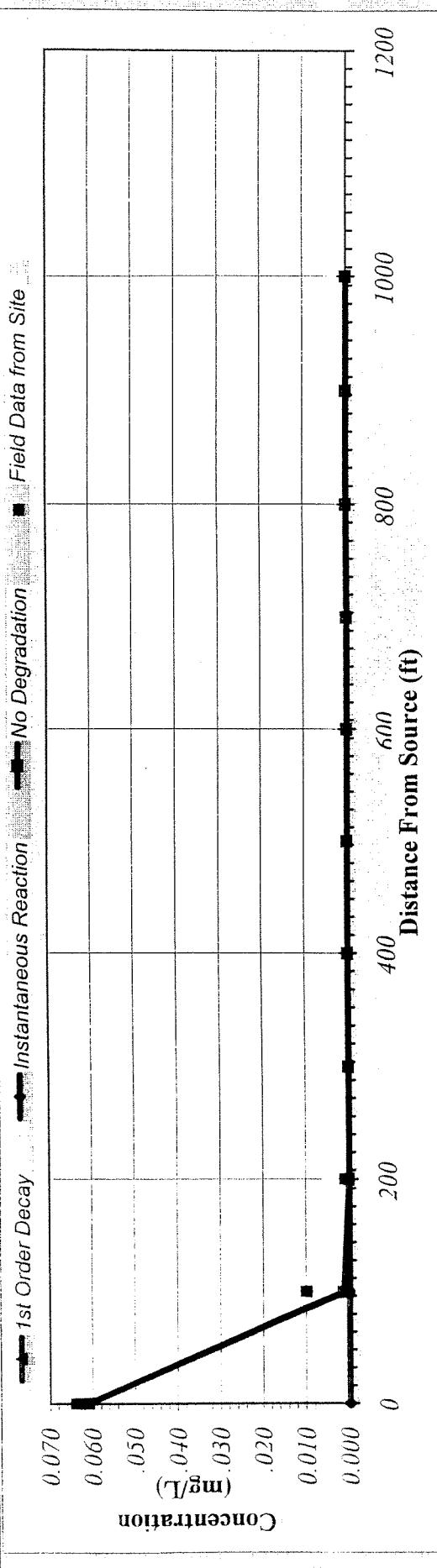
Time:
10 Years

[Return to Input](#)

[Recalculate This Sheet](#)

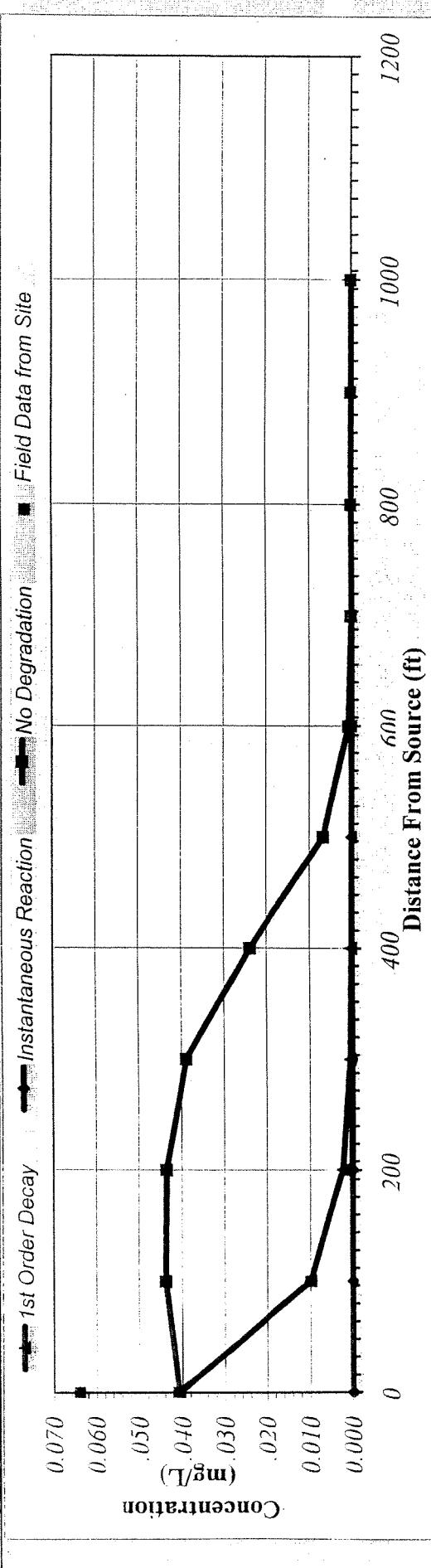
DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.061	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.061	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.064	0.010	0.001								



DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.041	0.044	0.044	0.039	0.024	0.007	0.001	0.000	0.000	0.000	0.000
1st Order Decay	0.041	0.010	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.064	0.010	0.001								



Calculate
Animation

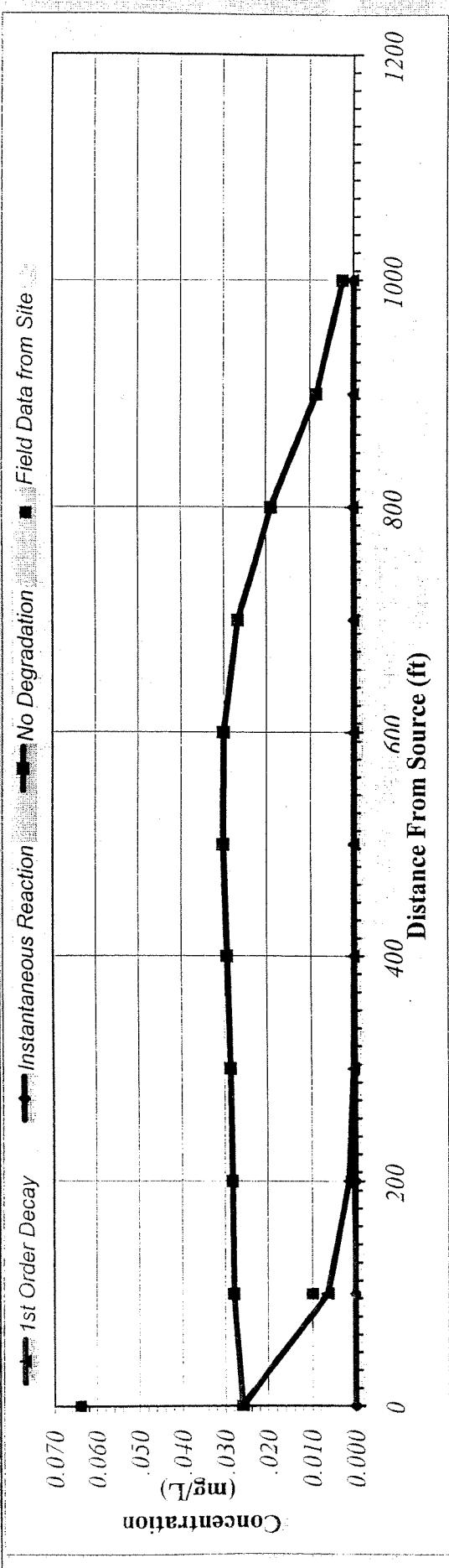
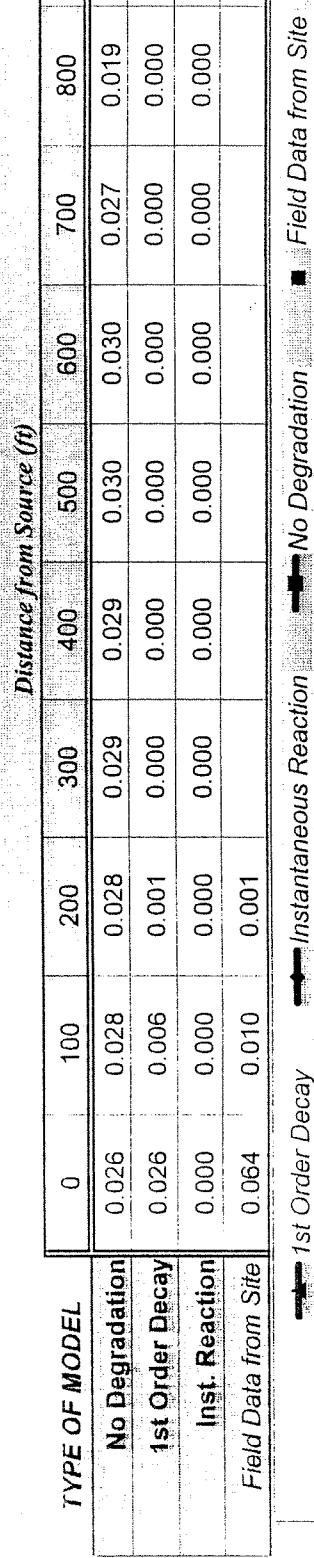
Time:
10 Years

Return to
Input
Sheet

Recalculate This
Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.026	0.028	0.028	0.029	0.029	0.030	0.030	0.030	0.030	0.030	0.030
1st Order Decay	0.026	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.064	0.010	0.001								



Calculate
Animation

Time:
20 Years

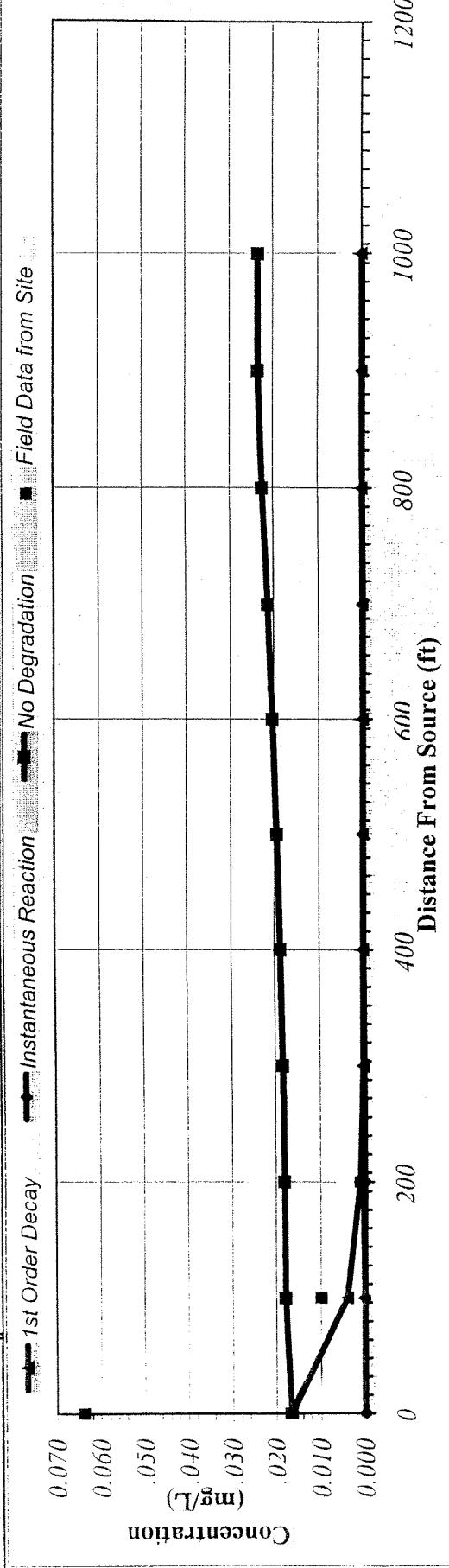
Return to
Input

Recalculate This
Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.017	0.018	0.018	0.018	0.019	0.019	0.020	0.021	0.023	0.024	0.024
1st Order Decay	0.017	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.064	0.010	0.001								

■ 1st Order Decay ■ Instantaneous Reaction ■ No Degradation

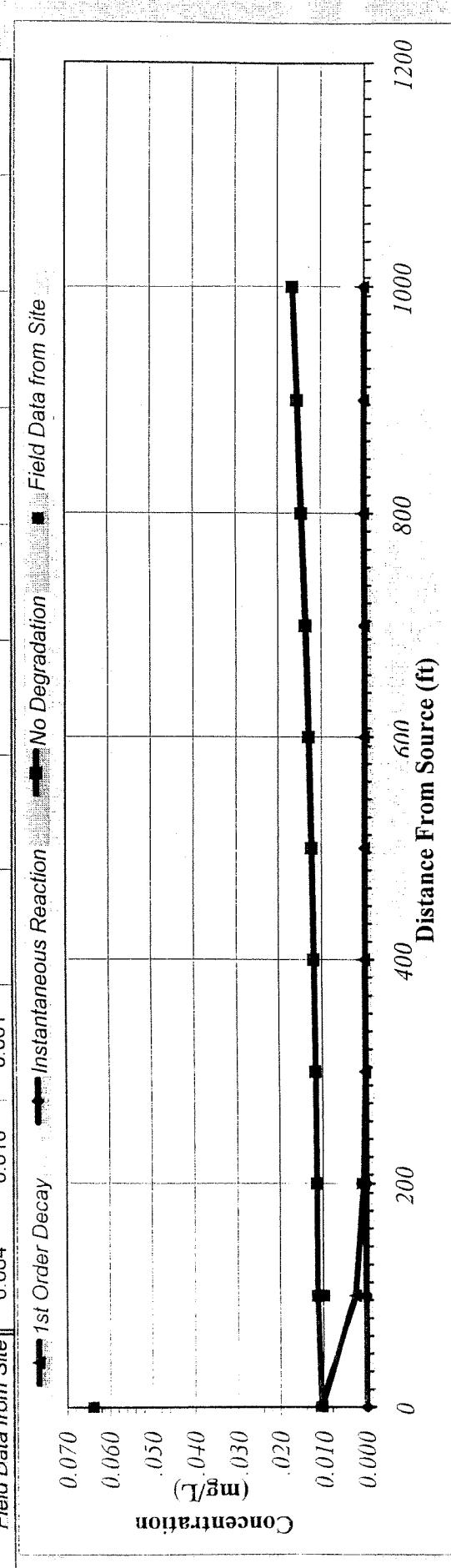


Time:

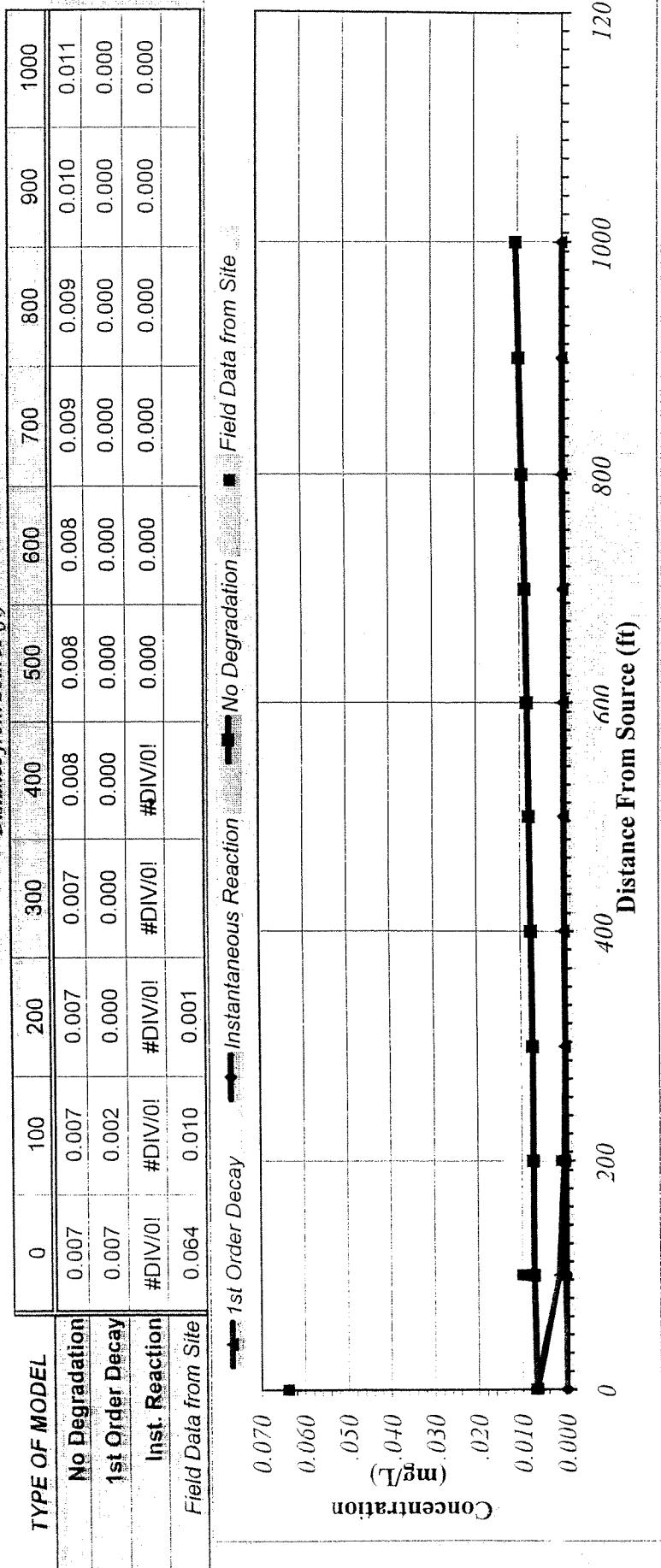
30 Years

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.011	0.011	0.012	0.012	0.012	0.013	0.014	0.015	0.015	0.015	0.017
1st Order Decay	0.011	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.064	0.010	0.001								



DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



1200

1000

800

600

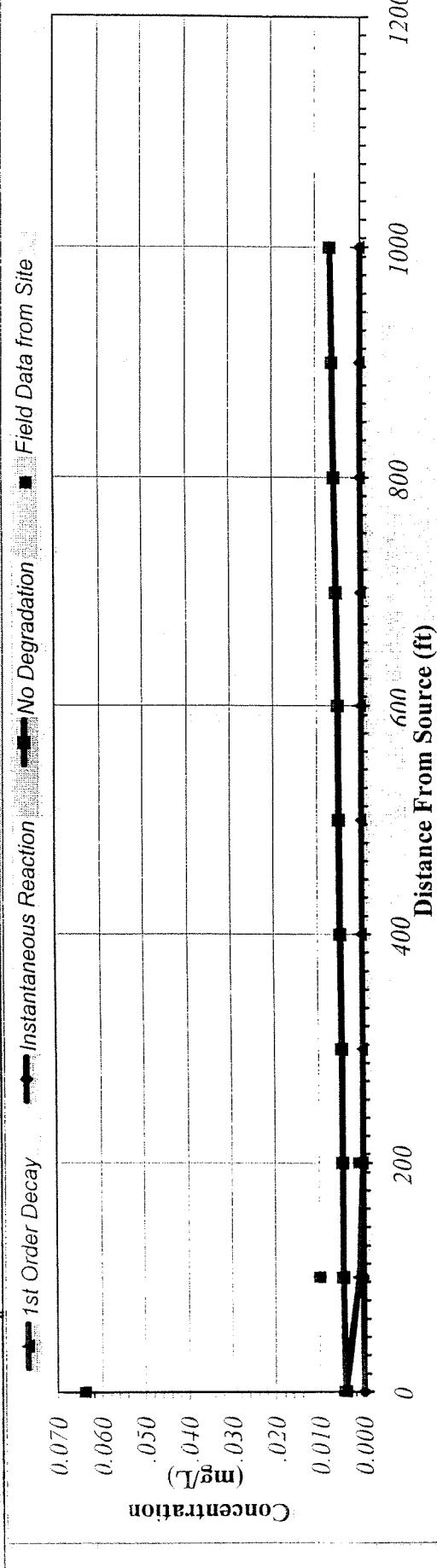
400

200

0

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.007
1st Order Decay	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								



Calculate
Animation

Time:
60 Years

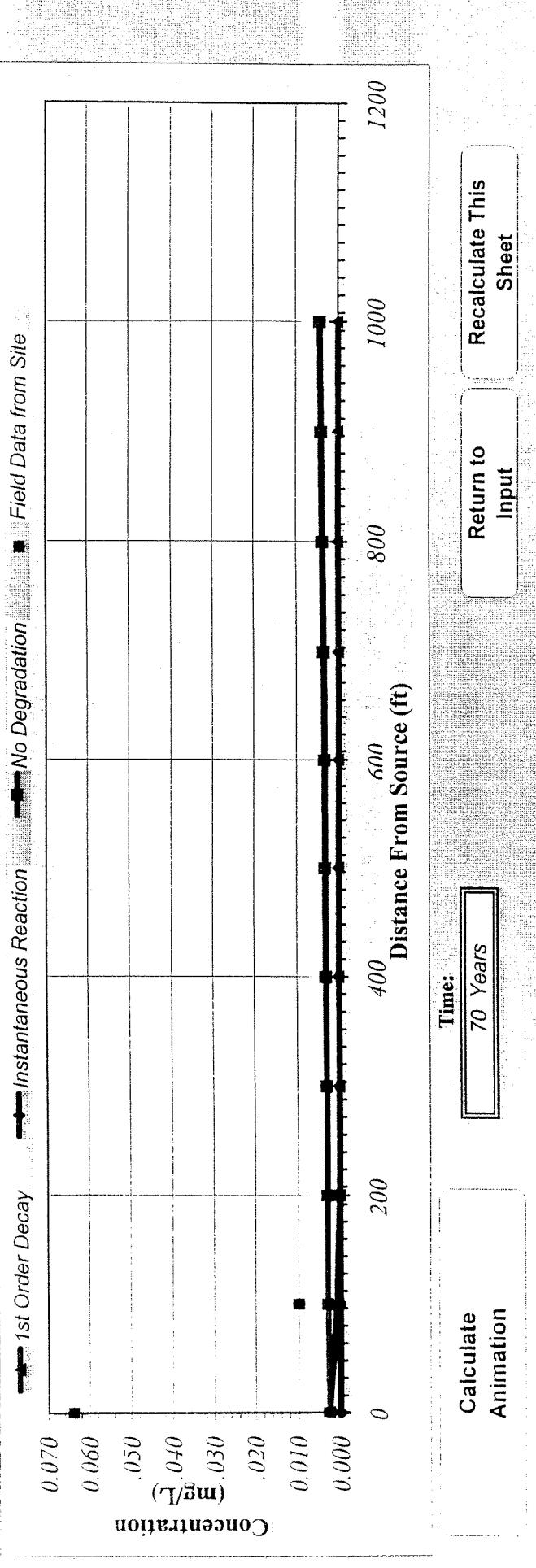
Recalculate This
Sheet

Return to
Input

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

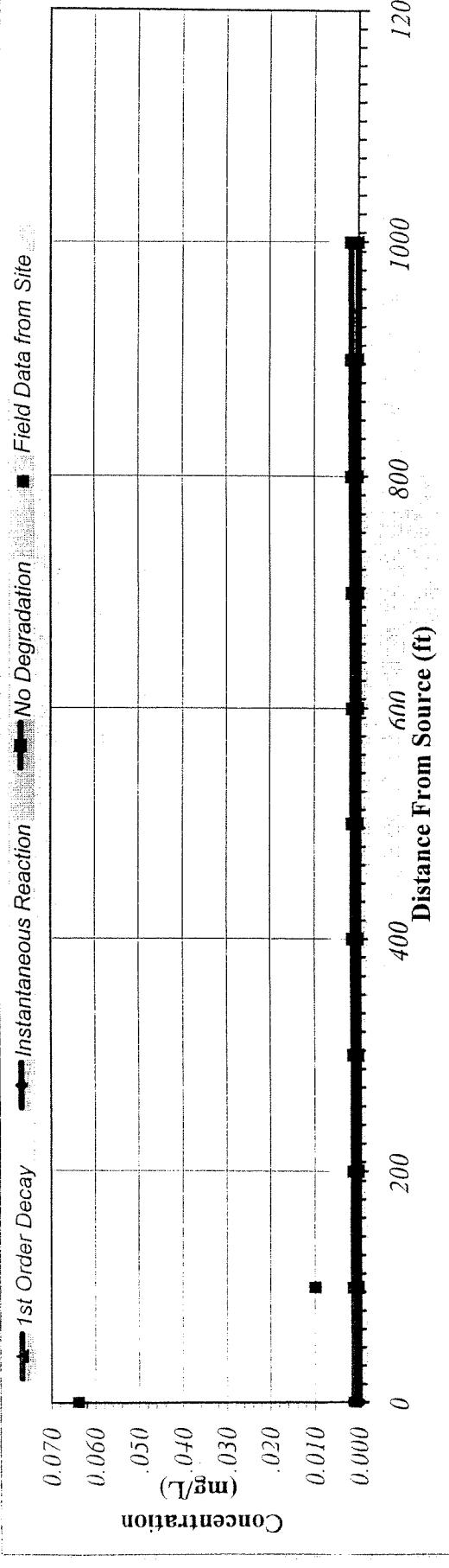
TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004
1st Order Decay	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								

■ 1st Order Decay ■ Instantaneous Reaction ■ No Degradation ■ Field Data from Site



DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
1st Order Decay	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								

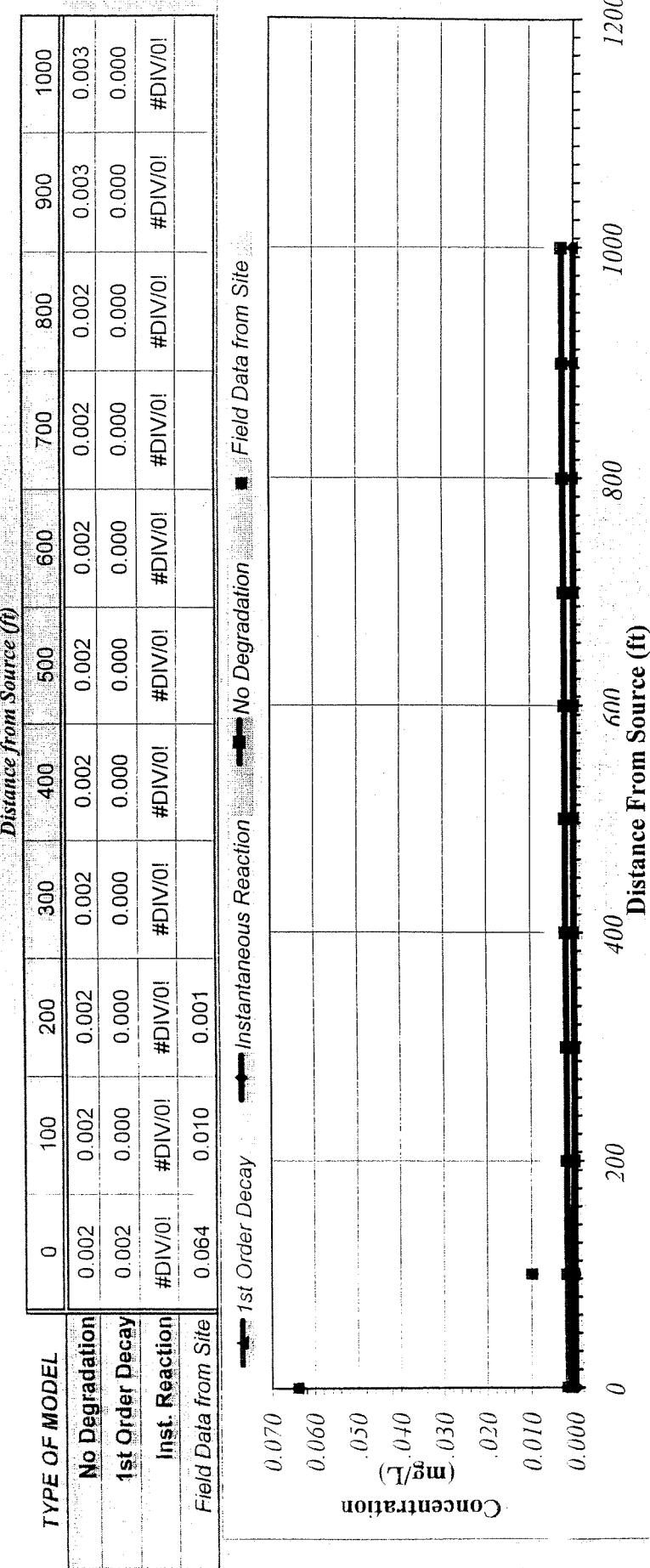


Calculate Animation
Return to Input
Time: 90 Years

Distance From Source (ft)
Time:
90 Years

Recalculate This Sheet
Return to Input

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



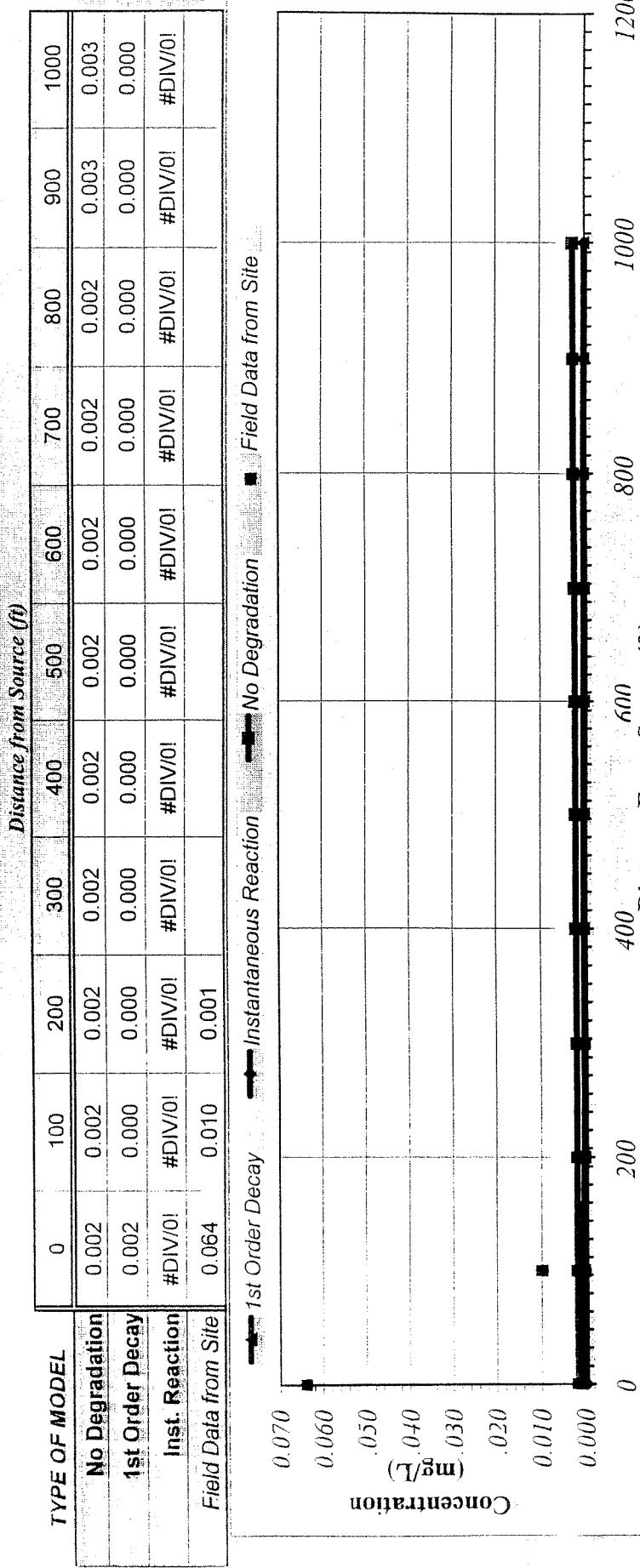
Calculate Animation

Time:
80 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



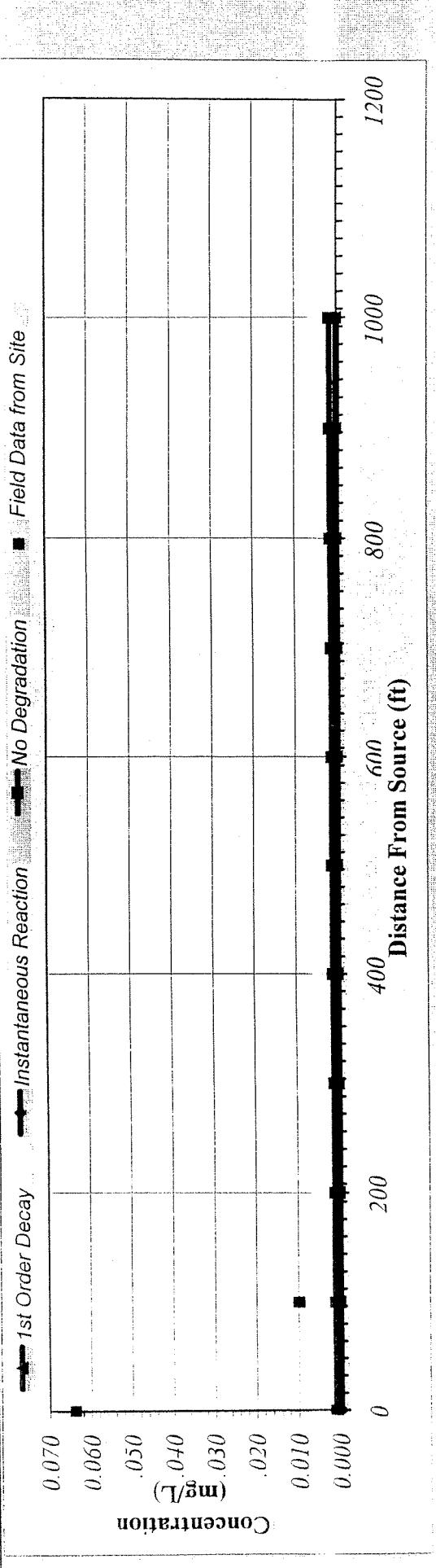
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Return to Input

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002
1st Order Decay	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								

— 1st Order Decay ■ Instantaneous Reaction ■ No Degradation ■ Field Data from Site



Calculate Animation

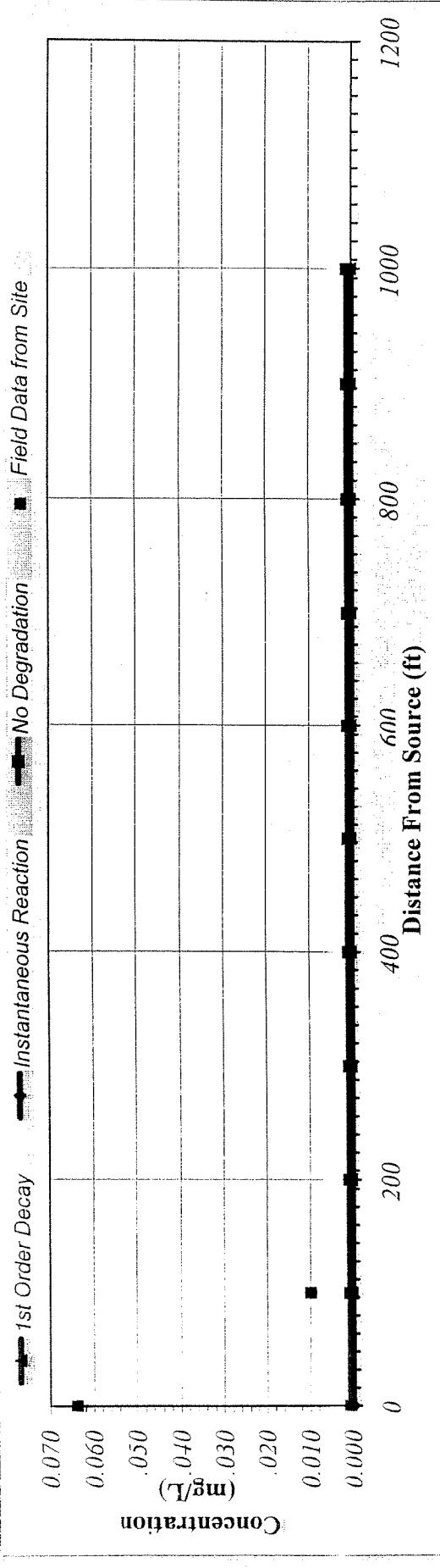
Time:

Return to
Input

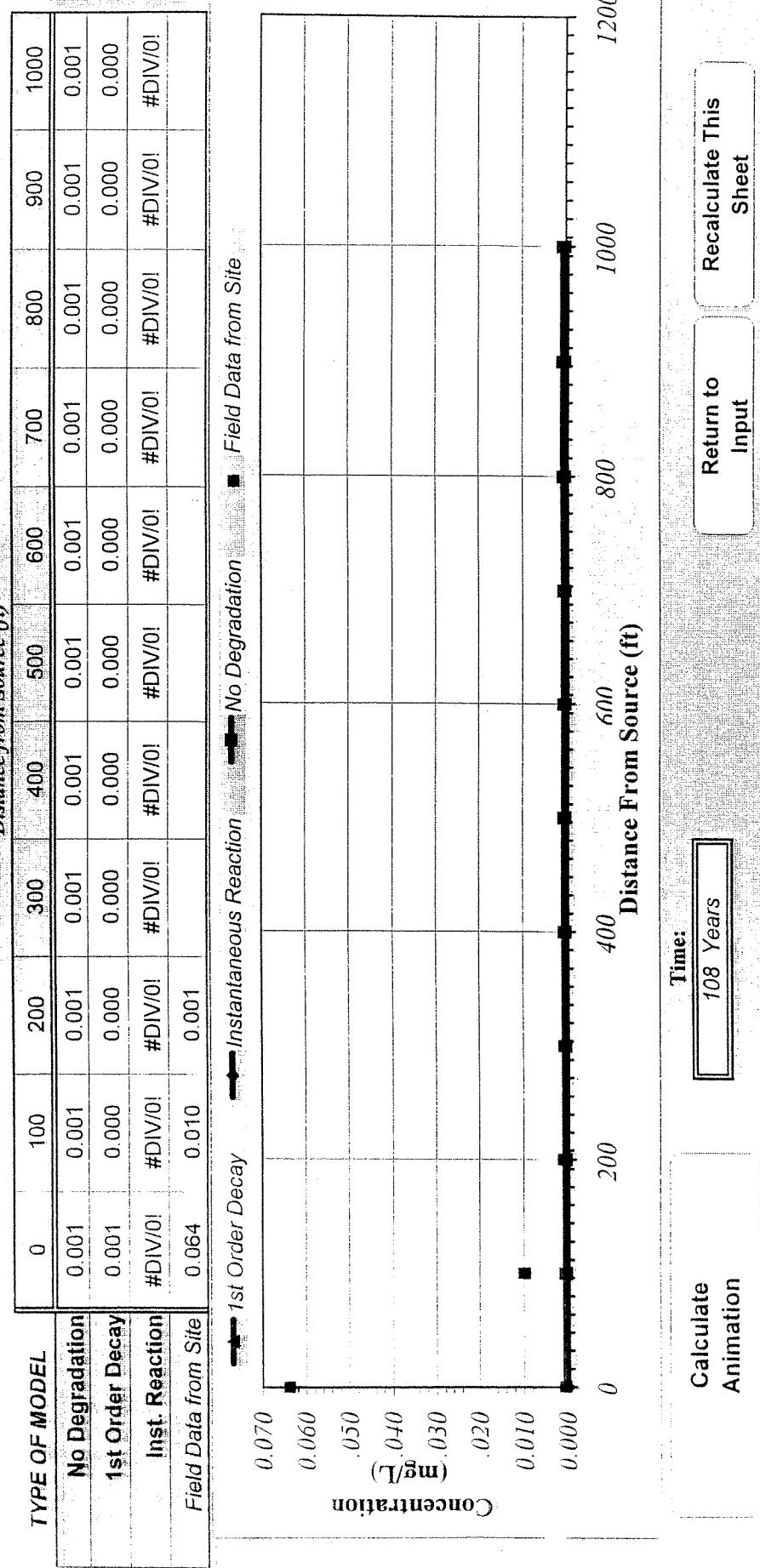
Recalculate This
Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
1st Order Decay	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								

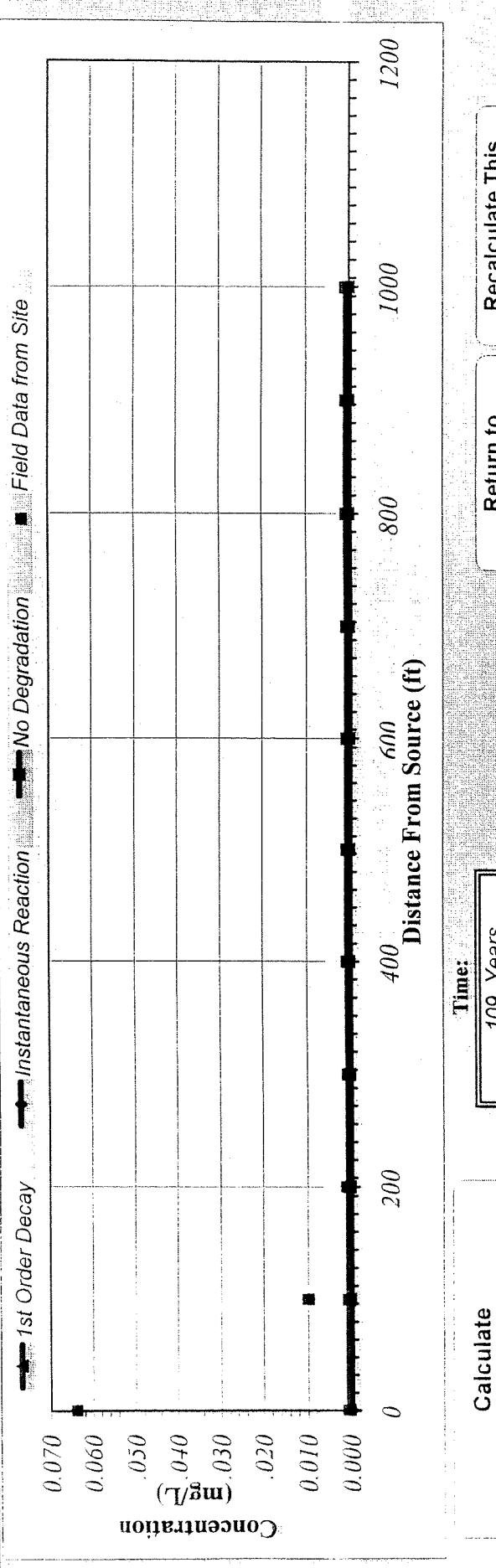


DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



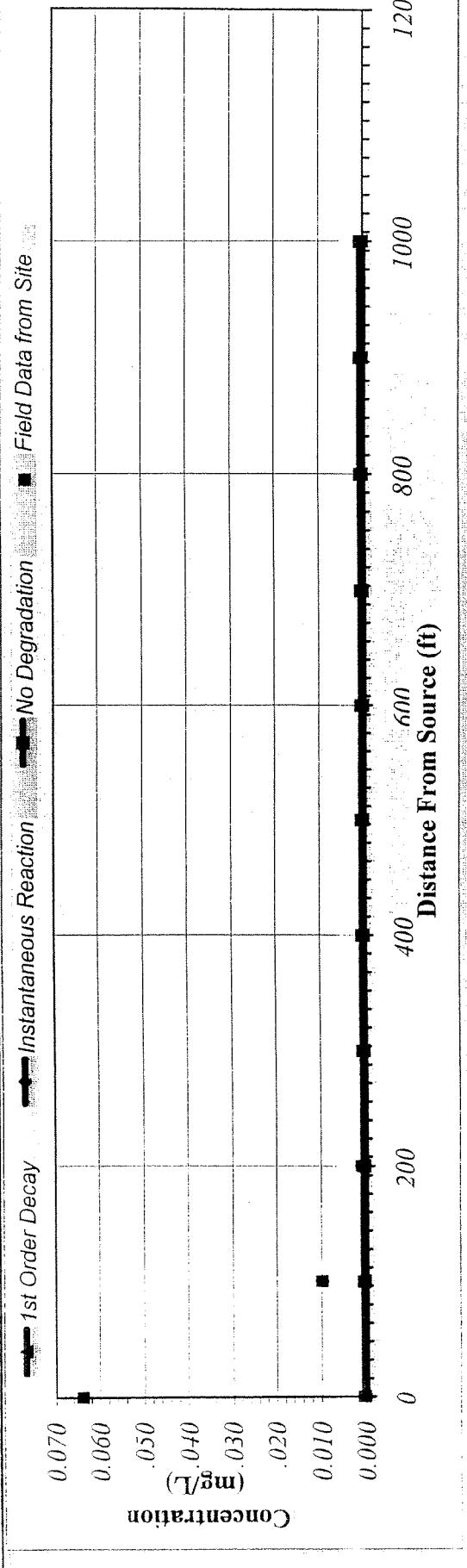
DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
1st Order Decay	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								



DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
1st Order Decay	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								



Calculate Animation

Time:
110 Years

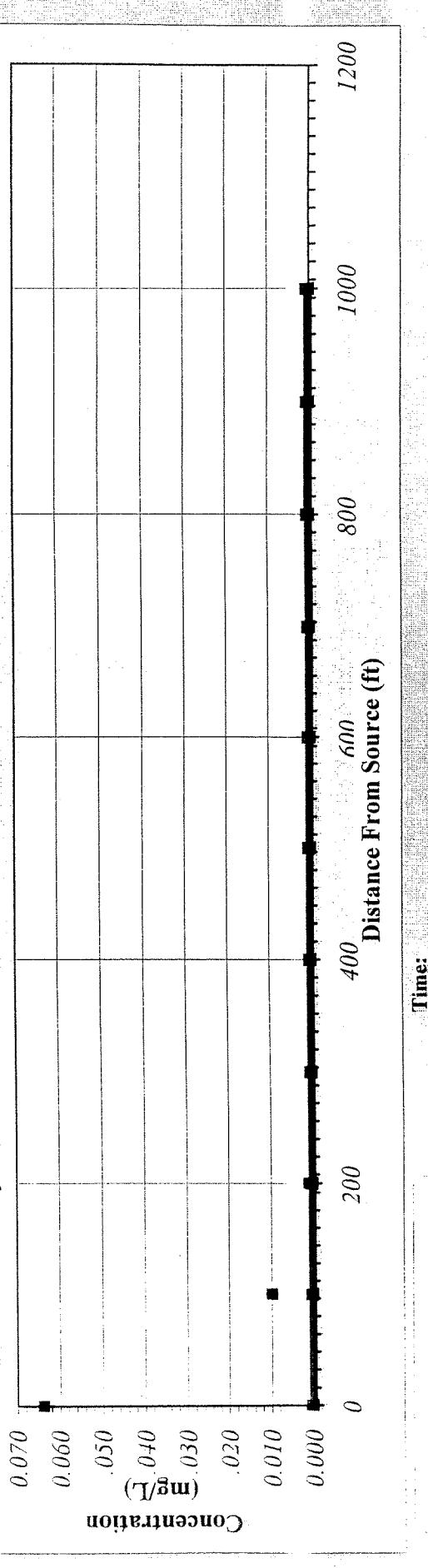
Recalculate This Sheet

Return to Input

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								

■ 1st Order Decay ■ Instantaneous Reaction ■ No Degradation ■ Field Data from Site



Time:
115 Years

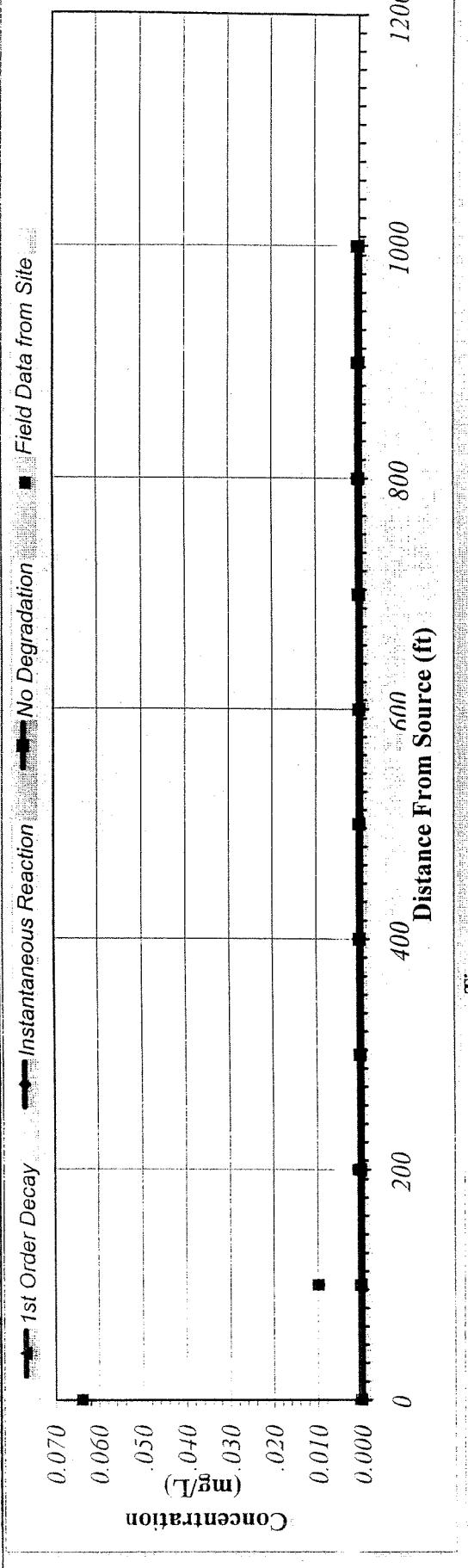
Calculate
Animation

Return to
Input

Recalculate This
Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
1st Order Decay	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								



Calculate
Animation

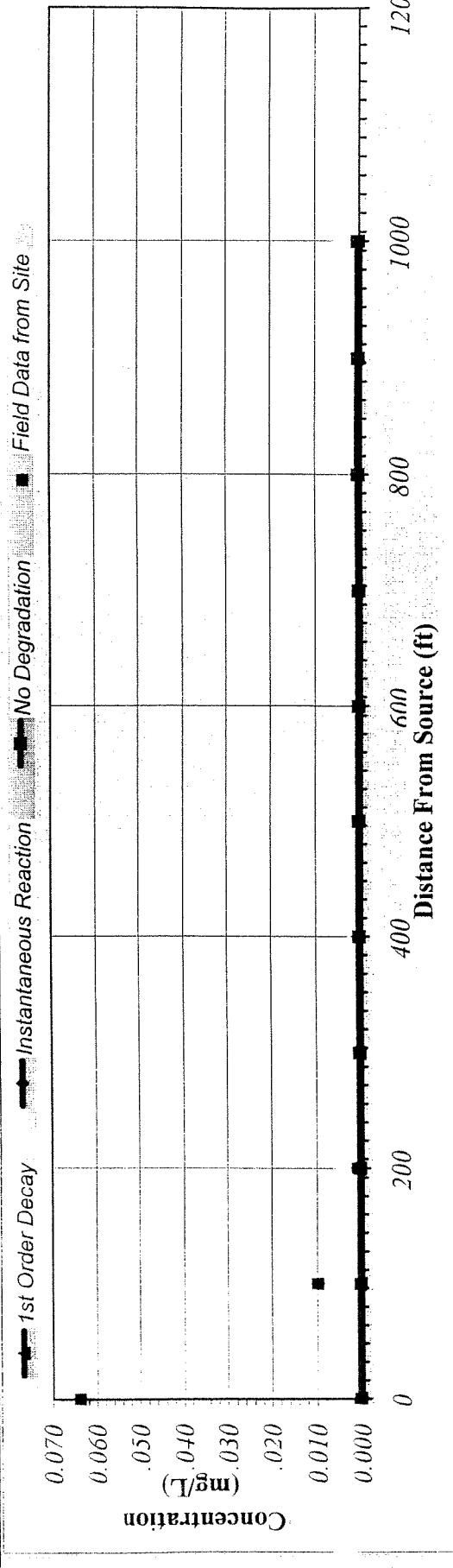
Time:
117 Years

Return to
Input

Recalculate This
Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Field Data from Site	0.064	0.010	0.001								



APPENDIX E

BIOSCREEN Input and Output for MTBE RNA

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence

Version 1.4

1. HYDROGEOLOGY

Seepage Velocity*	V_s	55.7 ↑ or 2.9E-03 0.008 0.43	(ft/yr) (cm/sec) (ft/ft)
Hydraulic Conductivity	K		
Hydraulic Gradient	i		
Porosity	n		

2. DISPERSION

Longitudinal Dispersivity*	α_{px}	12.2 1.2 0.0	(ft) (ft) (ft)
Transverse Dispersivity*	α_{py}		
Vertical Dispersivity*	α_{pz}		
Estimated Plume Length	L_p	240	(ft)

3. ABSORPTION

Retardation Factor*	R	1.1 ↑ or 1.7 12.59 2.5E-3	(-) (-) (kg/l) (L/kg)
Soil Bulk Density	ρ_{soil}		
Partition Coefficient	K_{oc}		
Fraction Organic Carbon	f_{oc}		

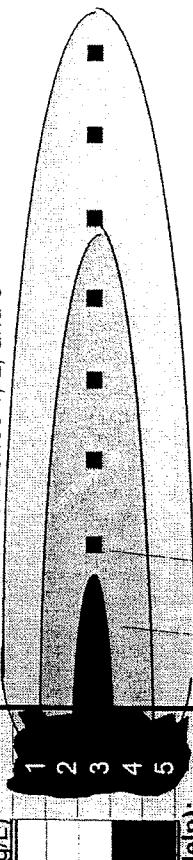
4. BIODEGRADATION

1st Order Decay Coeff*	λ	6.9E-2 ↑ or 10.00	(per yr) (year)
Solute Half-Life	t_{half}		
or Instantaneous Reaction Model	DO		
Delta Oxygen*	DO	5.8 6.3	(mg/l) (mg/l)
Delta Nitrate*	NO_3^-	16.6	(mg/l)
Observed Ferrous Iron*	Fe^{2+}	24.6	(mg/l)
Delta Sulfate*	SO_4^{2-}	7.2	(mg/l)
Observed Methane*	CH_4		

Data Input Instructions:

- 115 1. Enter value directly... or
↑ or
0.02
- 115 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).
- Variable* Data used directly in model.
- 20 Value calculated by model.
(Don't enter any data).

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



5. GENERAL

6. SOURCE DATA

Source Zones	Width* (ft)	Conc. (mg/l)*
1	15	0.051
2	15	0.55
3	55	2.707
4	15	0.55
5	15	0.051

Source Halflife (see Help):

<1	1	3
Inst React.	↑ or	1st Order

In Source NAPL, Soil

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	2.707	1.0	.01	.001
Dist. from Source (ft)	0	100	200	300

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN

CENTERLINE

View Output

View of Plume Looking Down

Observed Concentrations at Monitoring Wells
/ If No Data Leave Blank or Enter "0"

Help

RUN ARRAY

View Output

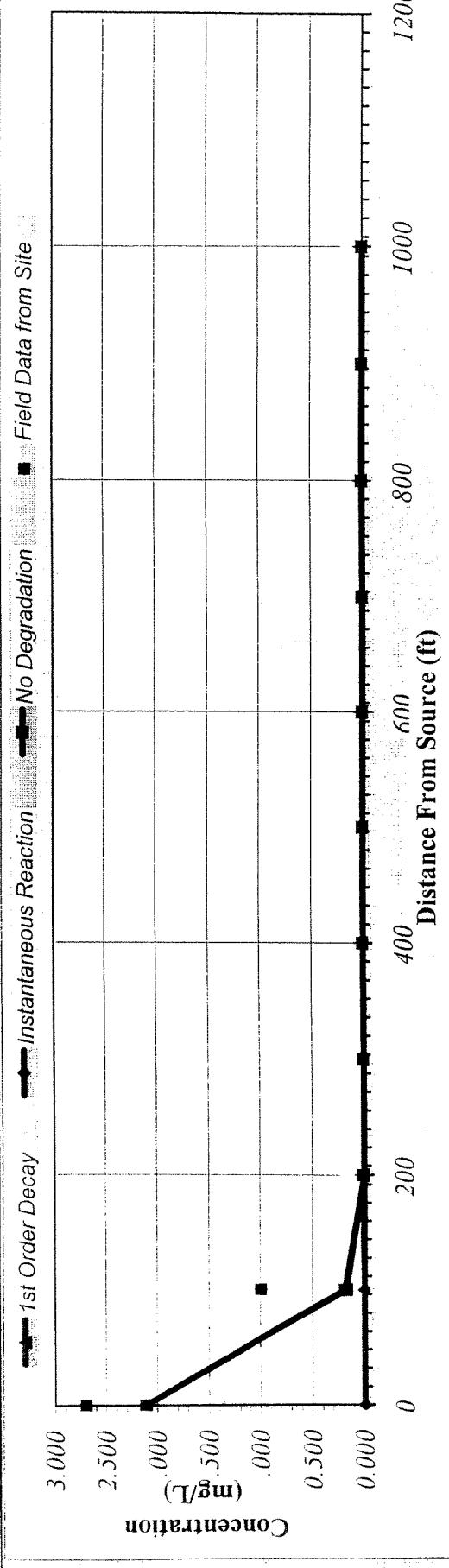
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, R, lambda, other

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

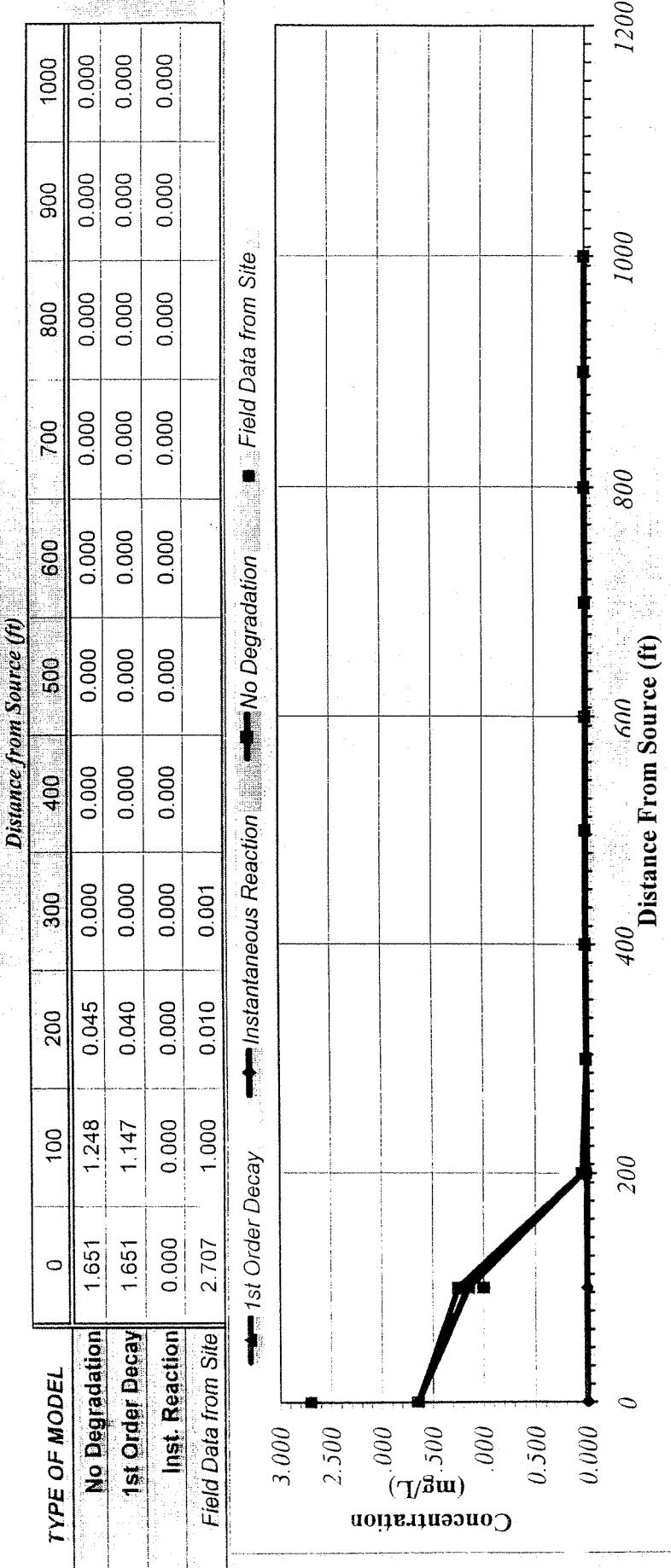
TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	2.114	0.187	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	2.114	0.178	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							



Time:

1 Years

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

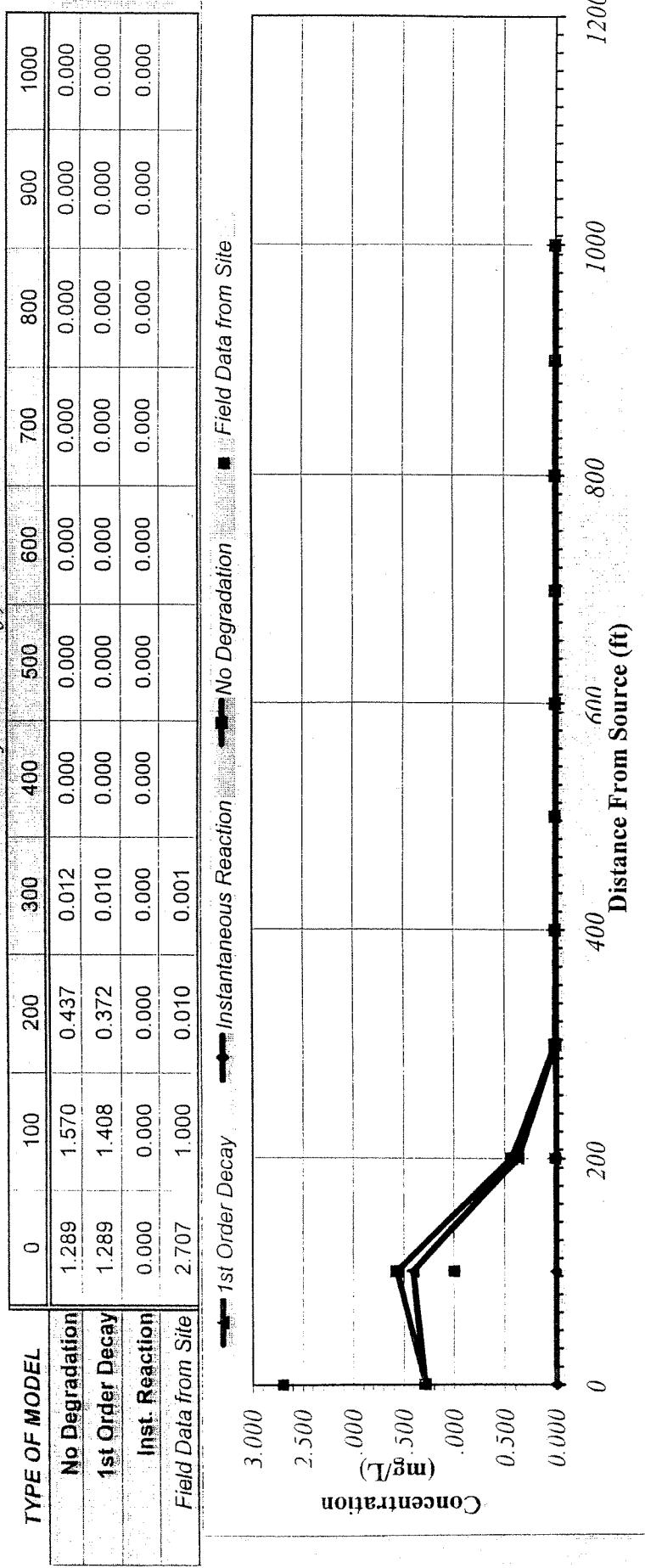


Calculate Animation

Recalculate This Sheet

Return to Input

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



Calculate Animation

Time:

3 Years

Recalculate This Sheet

Return to Input

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	1.006	1.429	1.085	0.142	0.003	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	1.006	1.263	0.888	0.112	0.003	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							



Time:

4 Years

Recalculate This
Sheet

Calculate
Animation

Return to
Input

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

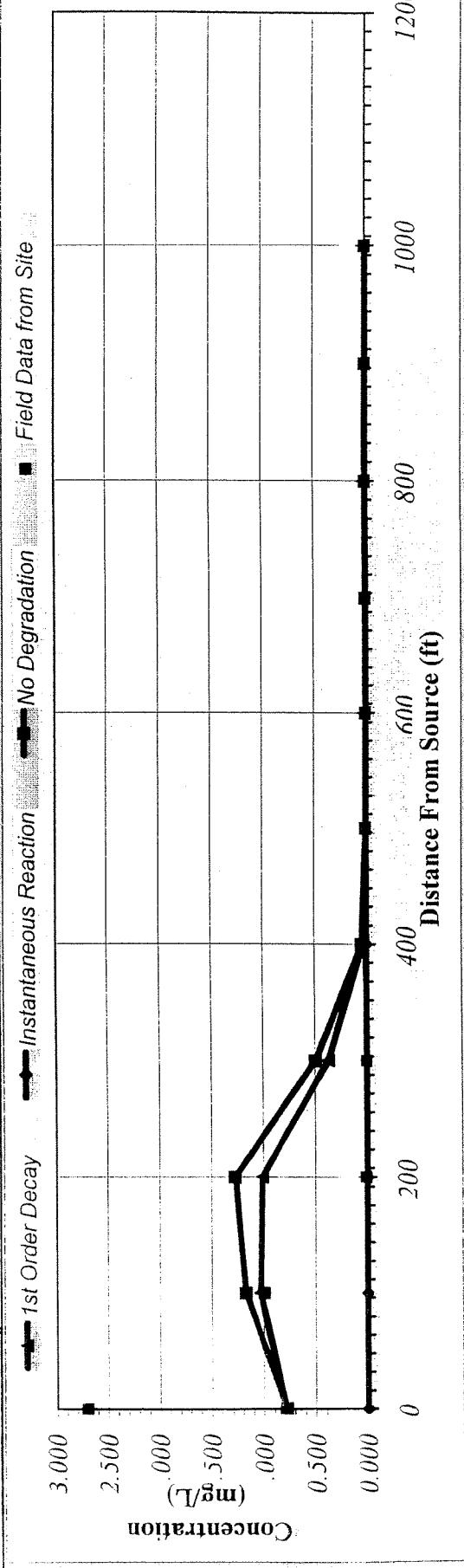
TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.786	1.177	1.275	0.496	0.045	0.001	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.786	1.032	1.014	0.374	0.033	0.001	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							

1st Order Decay

Instantaneous Reaction

No Degradation

Field Data from Site



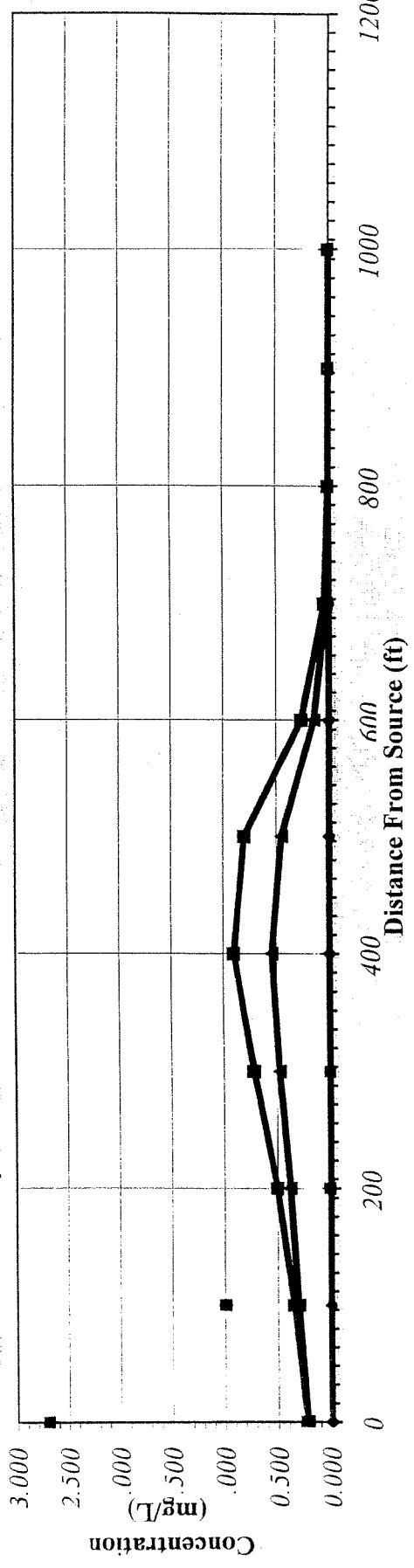
Time:

5 Years

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.2228	0.352	0.505	0.717	0.901	0.801	0.264	0.046	0.004	0.000	0.000
1st Order Decay	0.2228	0.307	0.384	0.480	0.545	0.453	0.144	0.024	0.002	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							

Legend: ■ Instantaneous Decay ■ No Degradation ■ Field Data from Site



Time:

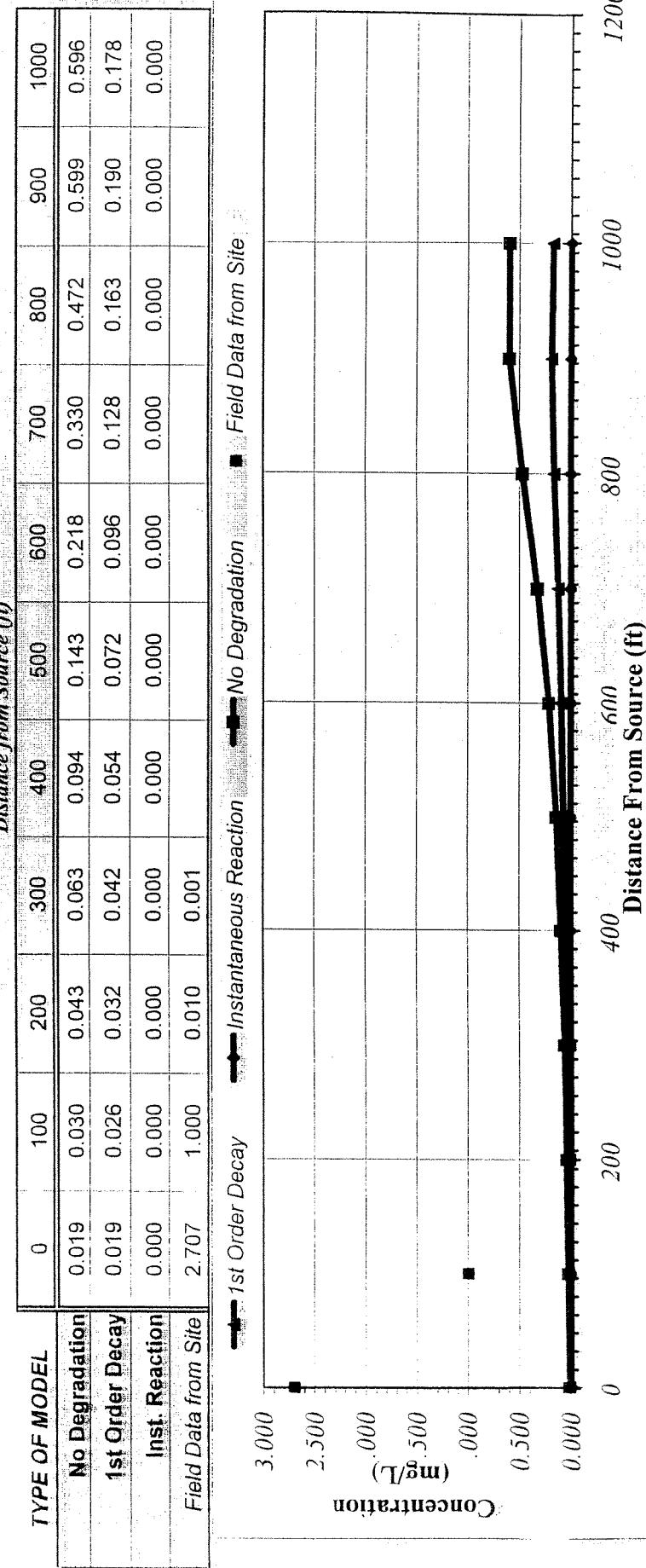
10 Years

Calculate
Animation

Return to
Input

Recalculate This
Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



Time:

20 Years

Recalculate This Sheet

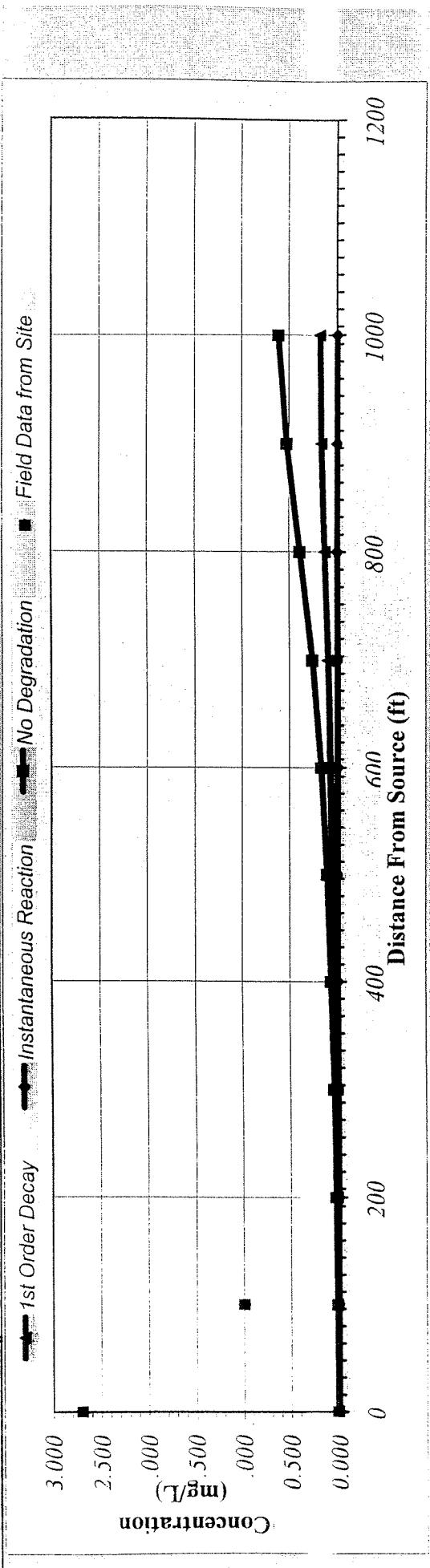
Return to Input

Calculate Animation

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.015	0.023	0.033	0.049	0.073	0.112	0.171	0.261	0.387	0.527	0.614
1st Order Decay	0.015	0.020	0.025	0.032	0.042	0.056	0.075	0.101	0.132	0.163	0.176
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							

■ 1st Order Decay ■ Instantaneous Reaction ■ No Degradation ■ Field Data from Site

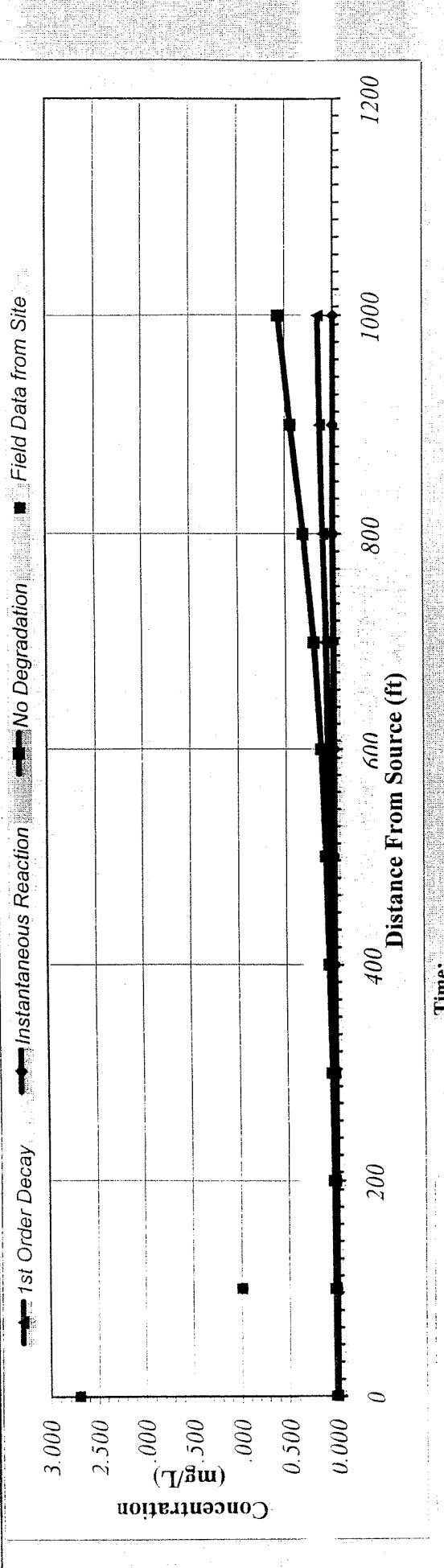


Time:

21 Years

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.012	0.018	0.026	0.038	0.057	0.087	0.134	0.206	0.311	0.445	0.567
1st Order Decay	0.012	0.016	0.020	0.025	0.033	0.044	0.059	0.079	0.105	0.135	0.158
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							

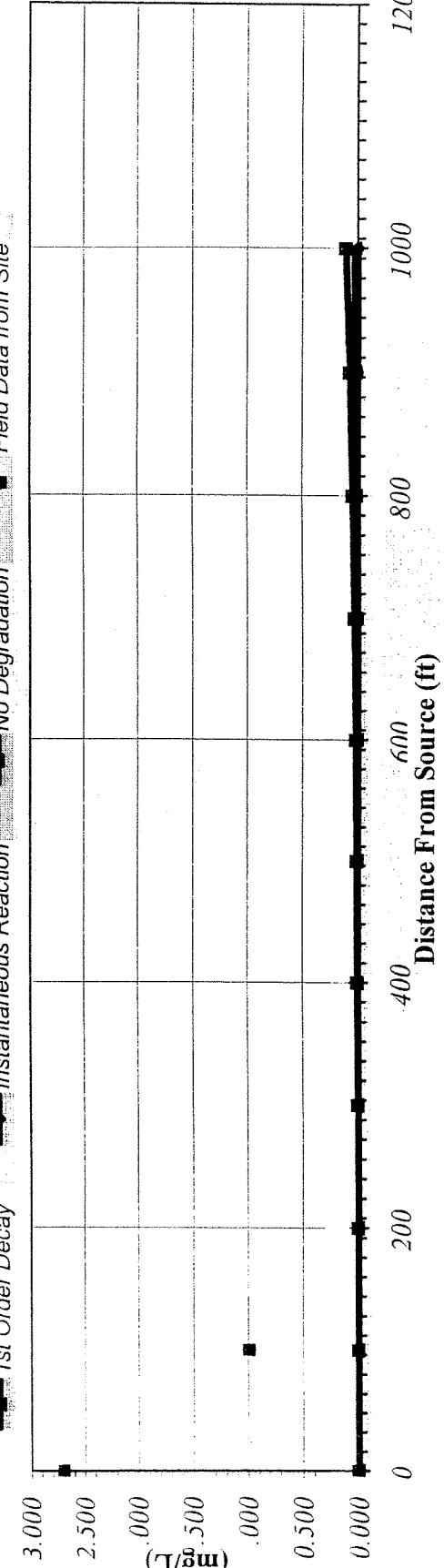


DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.002	0.002	0.004	0.005	0.008	0.012	0.019	0.029	0.045	0.070	0.110
1st Order Decay	0.002	0.002	0.003	0.004	0.005	0.006	0.008	0.011	0.015	0.020	0.028
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							

■ 1st Order Decay ■ Instantaneous Reaction ■ No Degradation ■ Field Data from Site

Concentration
(mg/L)



Time:

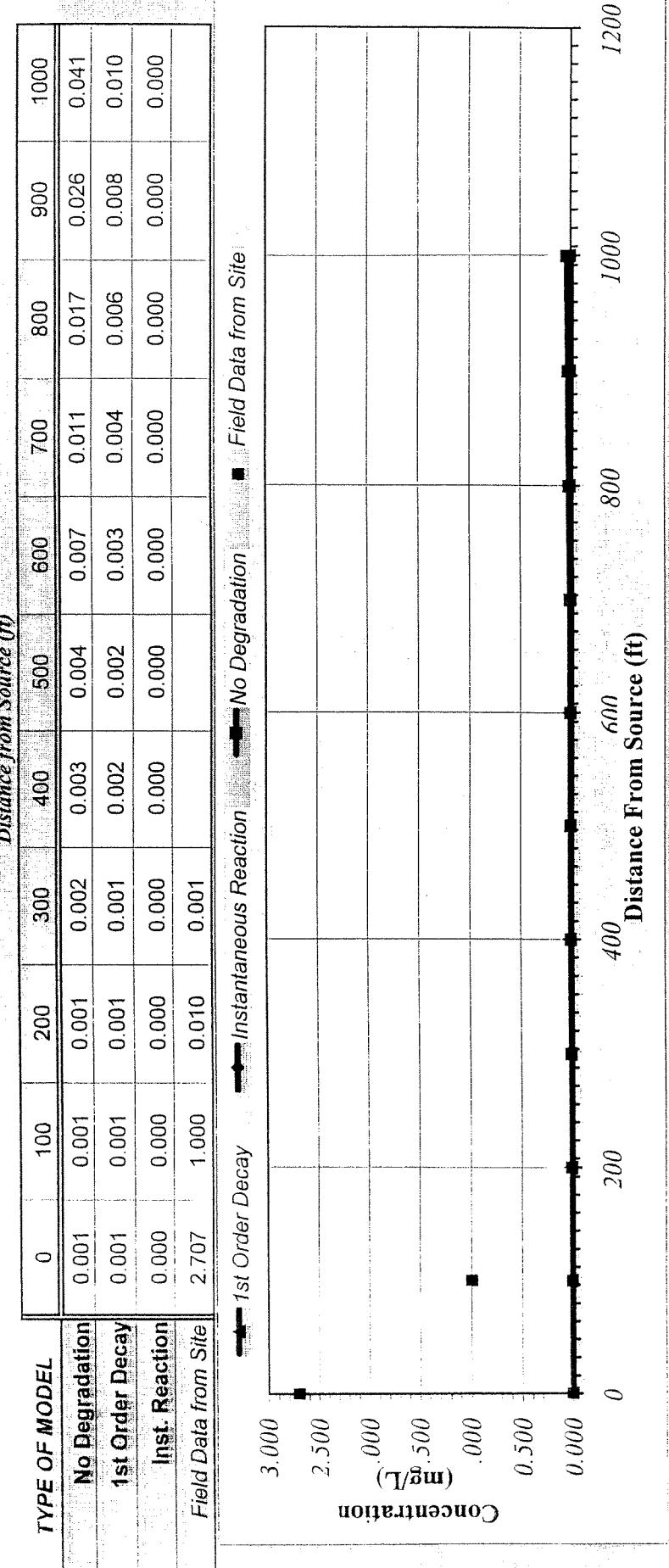
30 Years

Recalculate This
Sheet

Calculate
Animation

Return to
Input

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



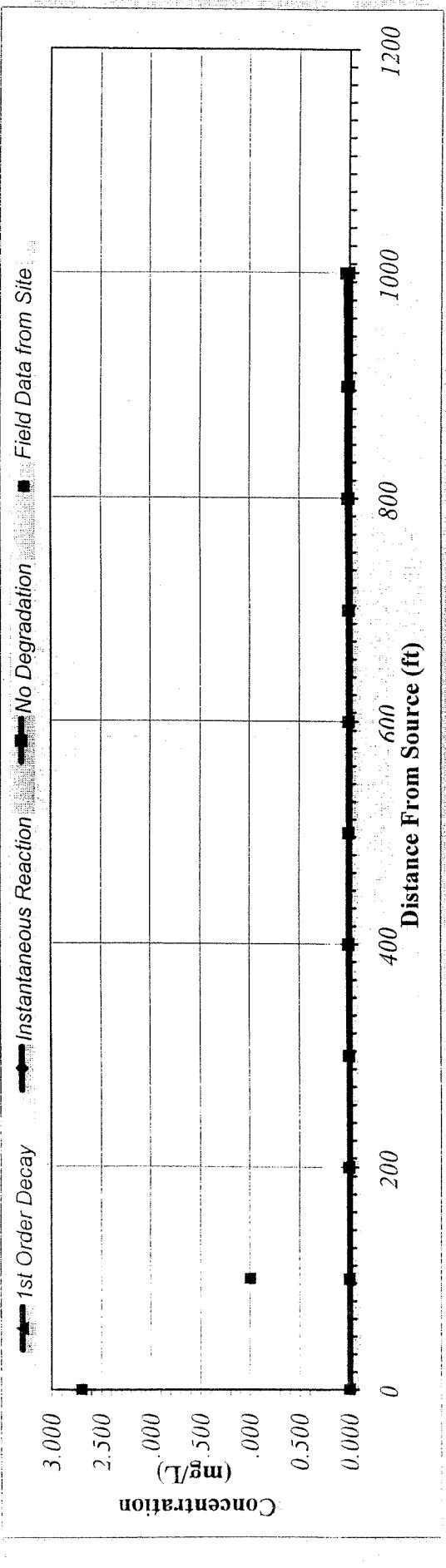
**Calculate
Animation**

**Return to
Input**

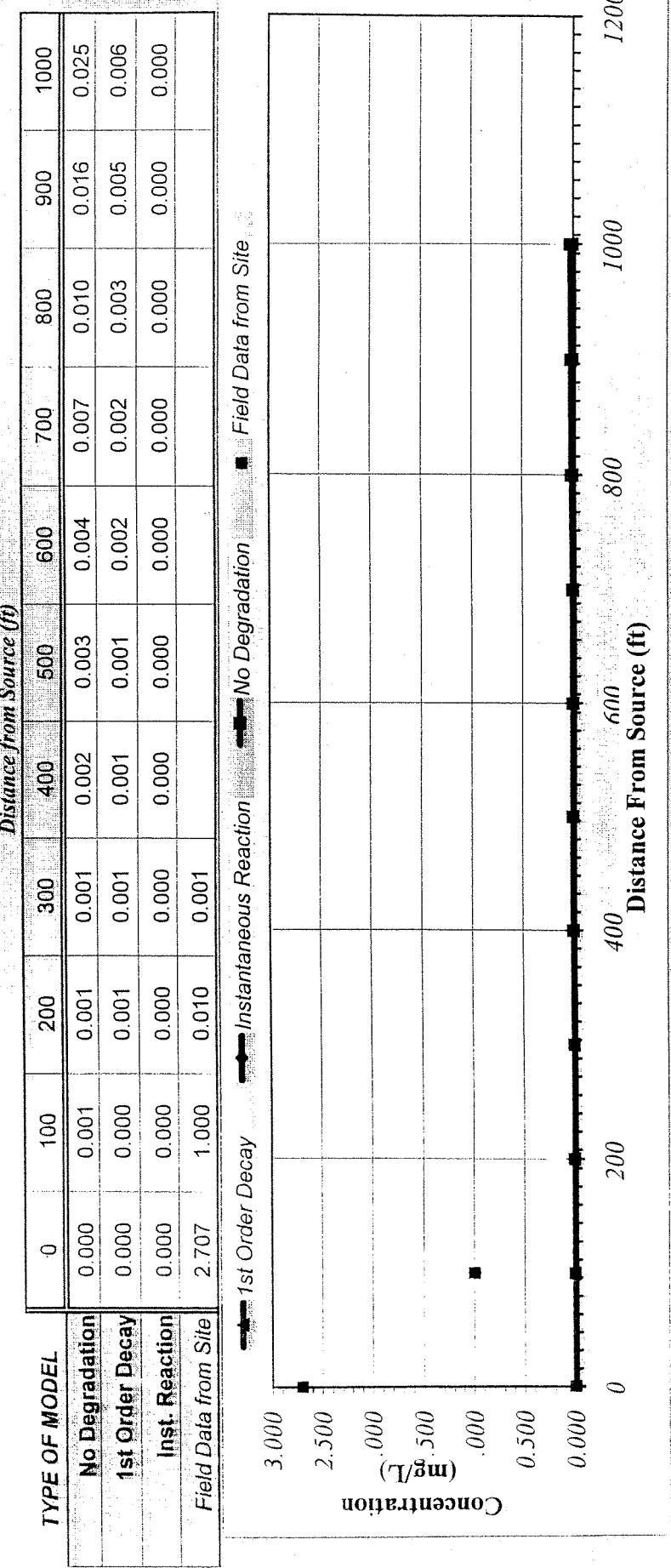
**Recalculate This
Sheet**

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.000	0.001	0.001	0.002	0.002	0.003	0.005	0.008	0.013	0.020	0.032
1st Order Decay	0.000	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.006	0.008
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							



DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



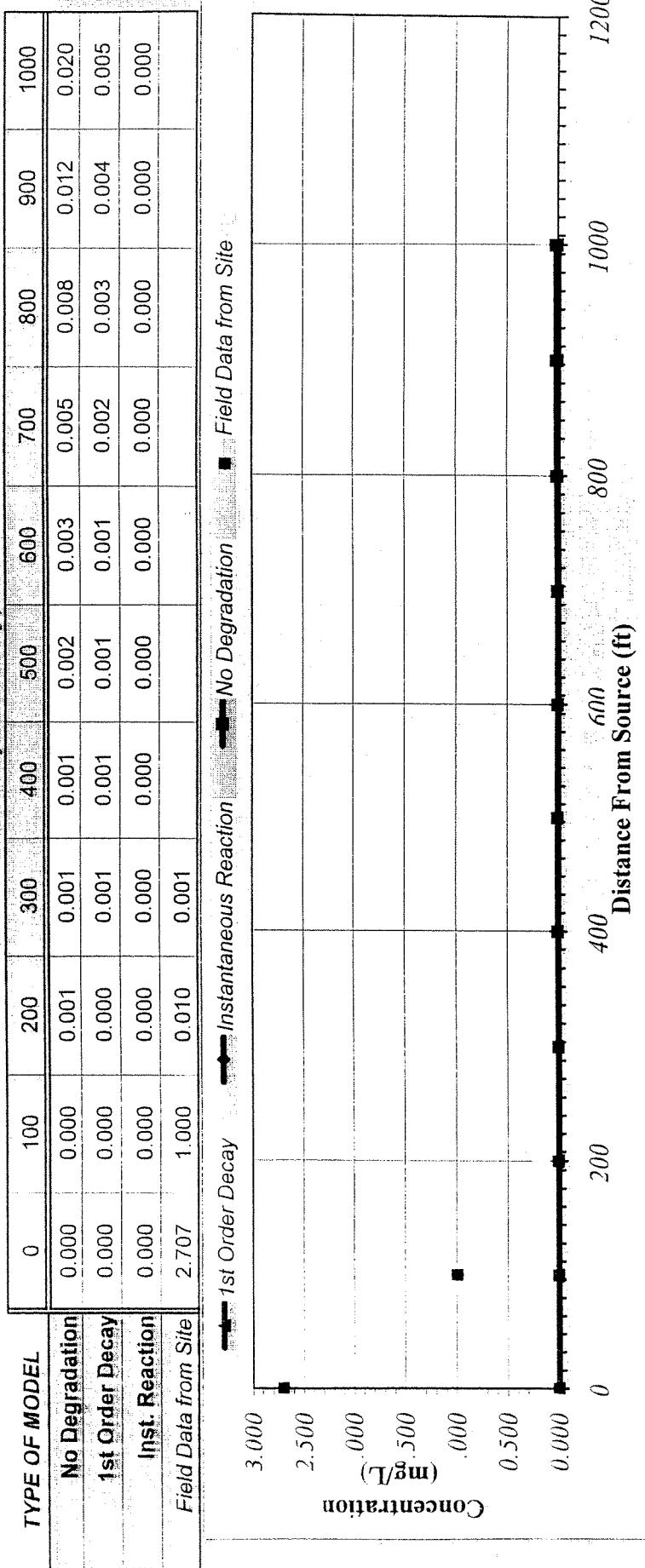
Calculate Animation

Time:
36 Years

Recalculate This Sheet

Return to Input

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

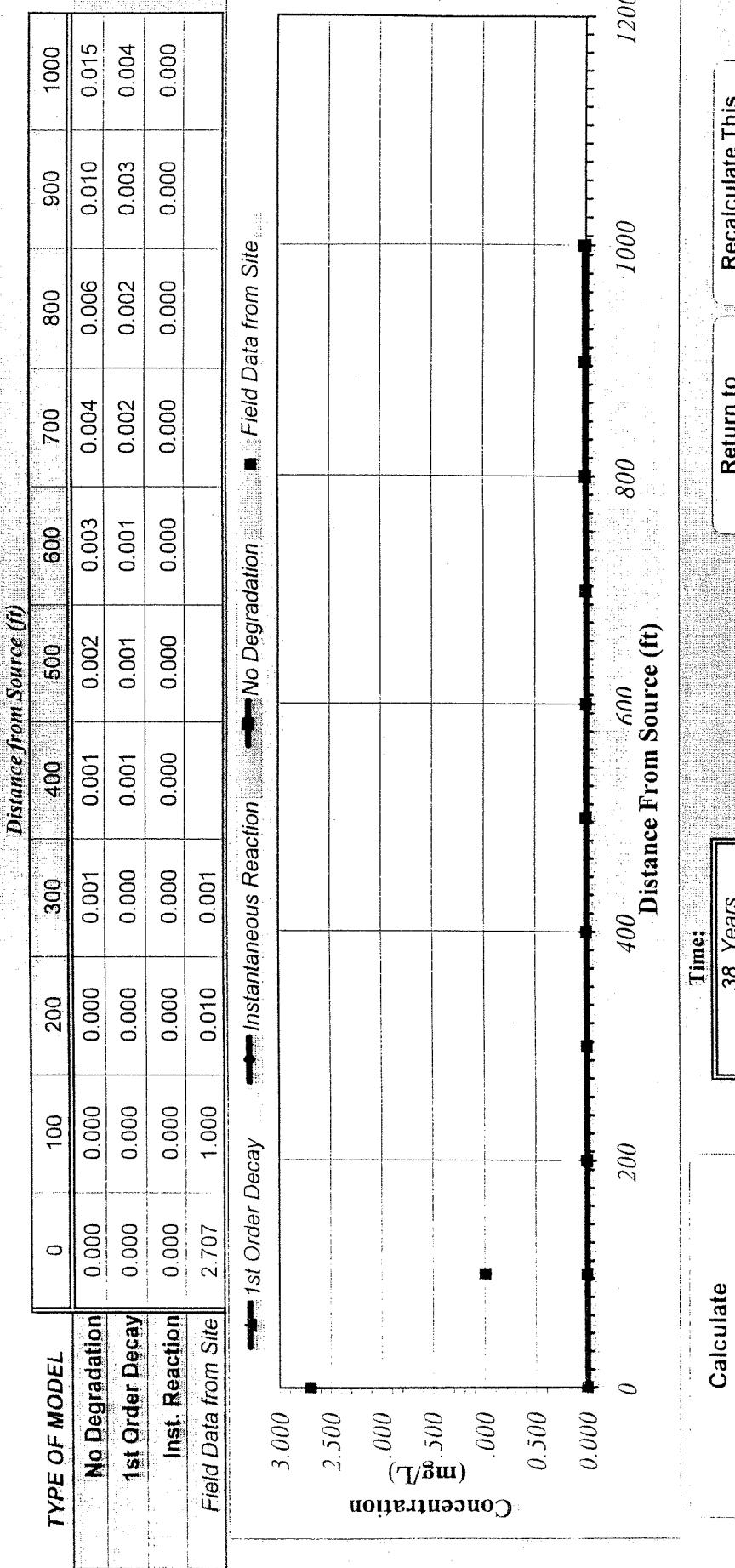


Calculate Animation

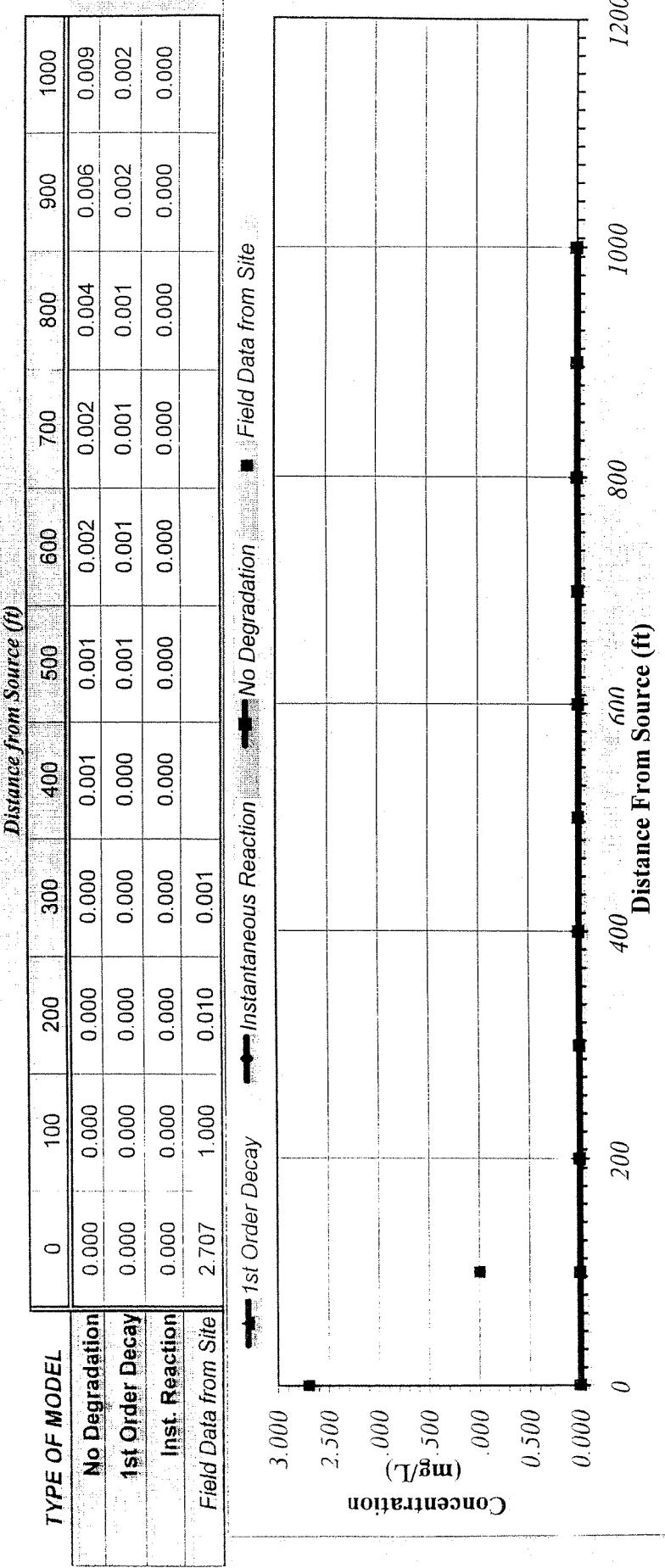
Time:

Return to Input
Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

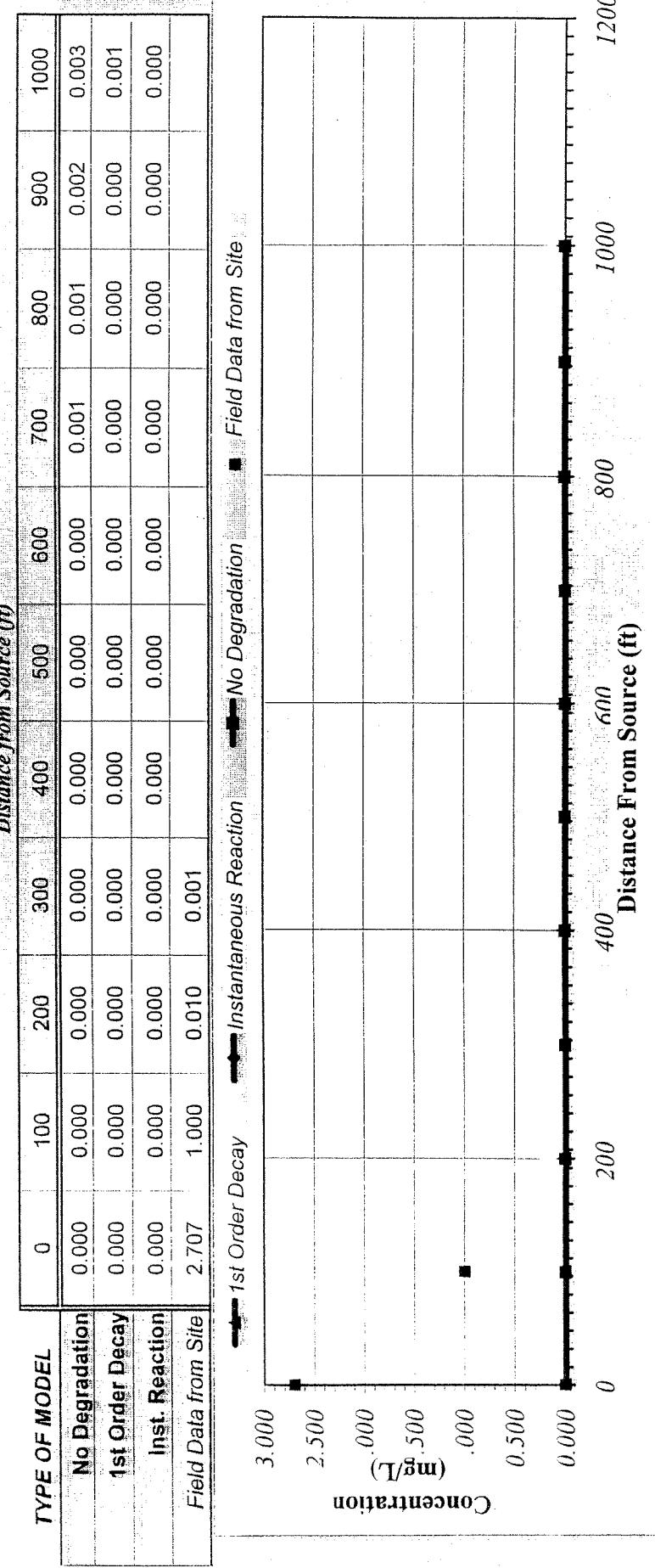


DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



Time:

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)



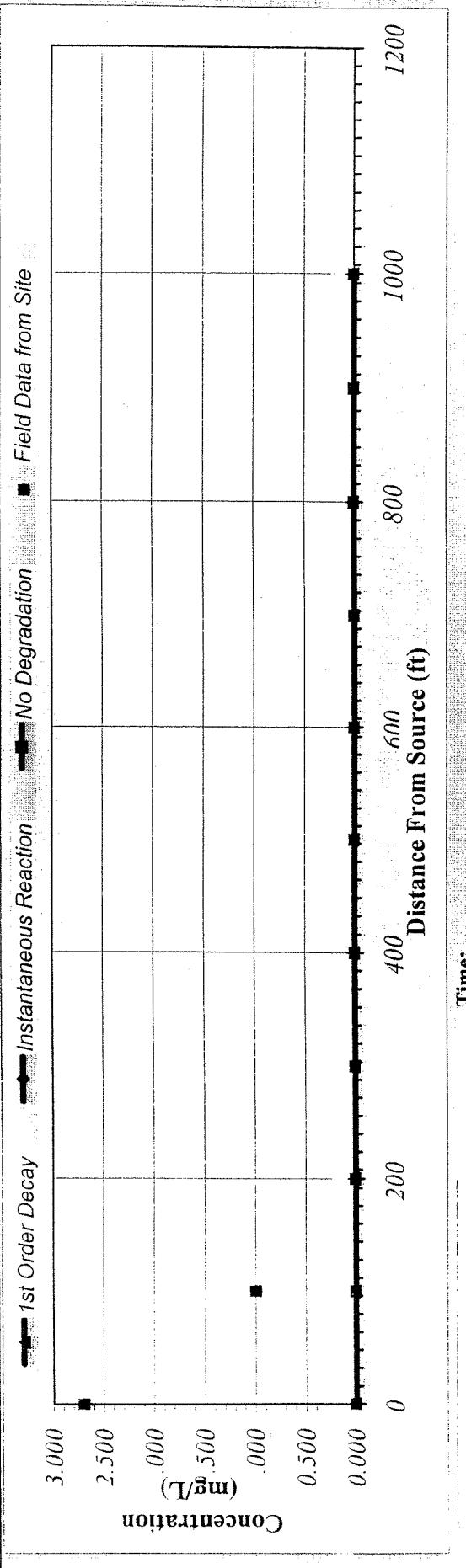
Calculate Animation

Time:

45 Years

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
1st Order Decay	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							



Calculate
Animation

Time:

50 Years

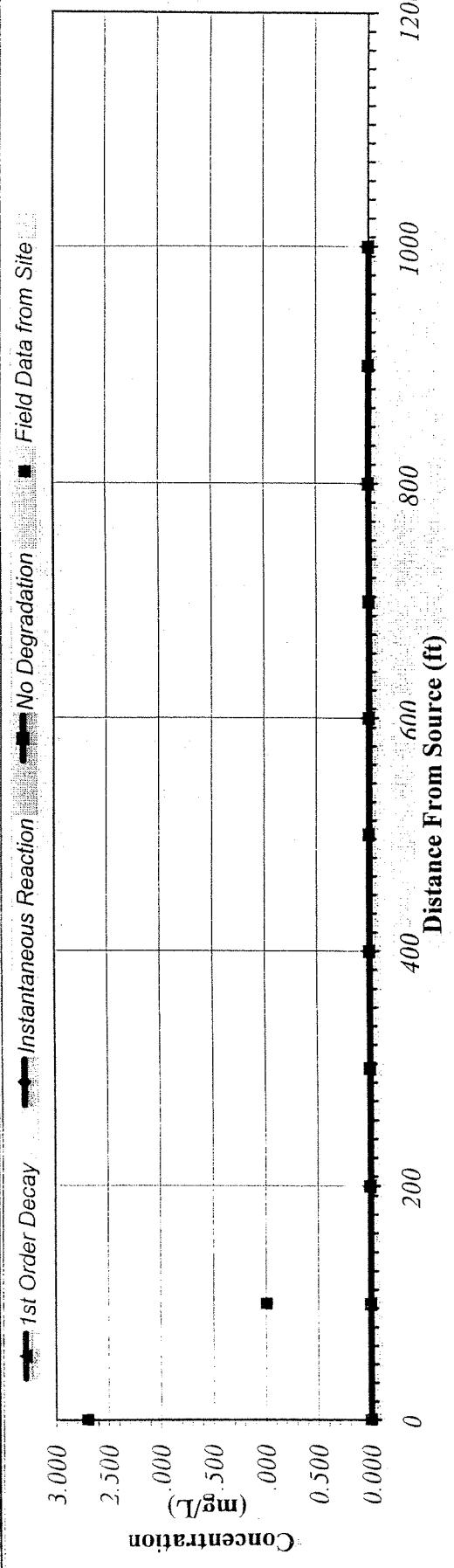
Return to
Input

Recalculate This
Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							

Distance from Site



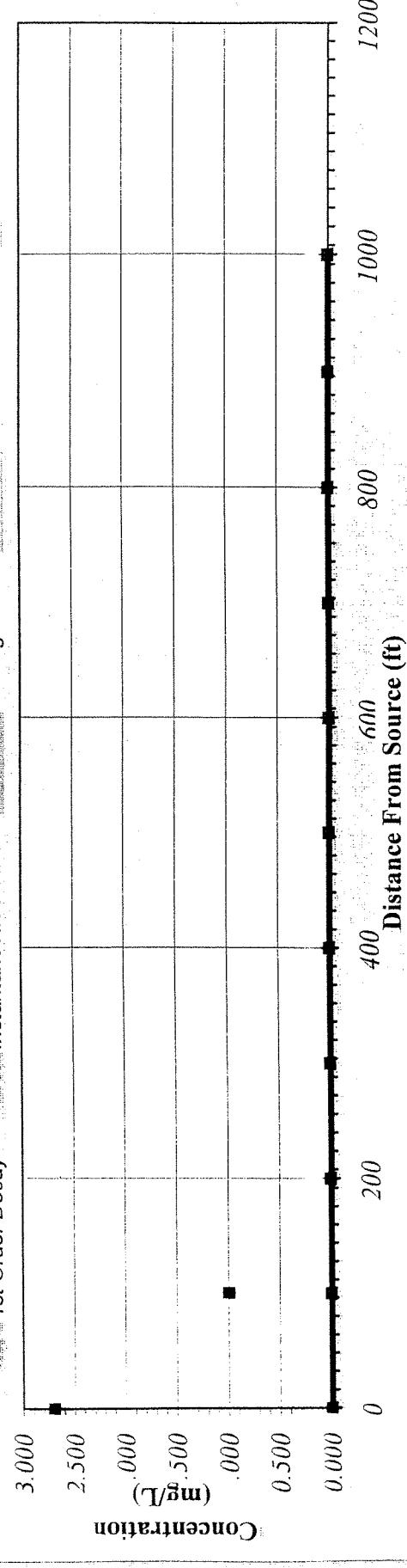
Time:

51 Years

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	2.707	1.000	0.010	0.001							

Legend: 1st Order Decay Instantaneous Reaction Field Data from Site



Calculate
Animation

Time:
52 Years

Return to
Input

Recalculate This
Sheet